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Part 1

NOTES ON THE SYSTEMATY AND DISTRIBUTION
OF MALAYAN PHANEROGAMS, I

By E. J. H. CORNER,

Botanic Gardens, Singapore

A preface to these notes is hardly necessary because, on perusal, it will become apparent that there is scarcely a genus in which some taxonomic or botanical revision is not needed. As the work is taken in hand according to the fancy or purport of the botanist, so the notes afford a means of publishing the technical results. The study of the Malayan flora has been progressing for more than a century, yet a very long time must elapse before there can be any near approach to finality. The investigation of a flora so rich and so ancient has been the concern of the merest handful of botanists, and it is a burden too great for so few lives. Add to this the difficulties of working alone in the tropics and of collecting in the vast forests, the lack of libraries and the isolation of botanists in countries floristically similar, and it is easy to understand how there has been much duplication and misunderstanding of each other's work. Now, the accumulation of specimens, the publication of "floras", the improvement in description and, not least, the facilities of modern transport and of interchange of ideas should enable one largely to overcome those obstacles, so that it is time to unify the research which has been progressing in different lands. Particularly is this important in Malaya which connects the areas explored by the British botanists in India and Siam, the French in Indo-China, the American in the Philippines and the Dutch in the Netherlands Indies. It must be realised, moreover, that much of the present disagreement and misunderstanding springs from a lack of botanical knowledge. Most

tropical plants have been described and classified from dried specimens though the true estimation of species and genera must always demand an extensive acquaintance with the living plants: what may seem diagnostic characters in dried specimens often prove to be variations among individuals or branches of the same individual when the living plant is studied. Indeed, intensive research on any of our Malayan phanerogams will reveal many misconceptions and faulty or doubtful identifications so that specific information, unsupported by specimens for reference, must be accepted with great caution. Perhaps, the falsest belief is that there is a large endemism in the islands and political divisions of the East Indies. It should be remembered that *Canangium odoratum* is a forest tree from Siam to Australia, and *Ficus variegata* from Hongkong to Java.

My own notes have arisen from an unexpected quarter. Intending to write a semi-popular book about the common trees of Malaya, I imagined that their botanical names would have been fixed. But I soon discovered that this was far from being the case. Indeed, it was not uncommon to find that what was apparently the same tree was referred to by different names by each of several different authors. Thus, when Hooker, Trimen, King, Kurz, Craib, Gagnepain, Ridley, Koorders, Valetton, Merrill, and other authors of standard systematic works concerning the flora of the Malay Peninsula and adjoining territories showed little uniformity in nomenclature, it was not surprising to find the nomenclature of such standard economic works as those of Watt, Heyne and Burkill, to say the least, unreliable. Indeed it has become evident that for too many years botanical and economic information from the Malay Peninsula and adjoining territories has been poured like new wine into old bottles, so that we cannot now be sure that our information bears the correct label. Such information may be worse than useless, and it seems time to call a halt to examine the labels on our bottles. That this is no easy task will be appreciated from perusal of the notes published in this Bulletin, but to shirk it, or to postpone it, for the sake of the more rapid publication of a semi-popular, semi-botanical work would be a grave disservice to science and to the public to whom such semi-popular work is to be addressed.

For my own satisfaction, I have adopted the principle that no alteration in botanical names should be accepted unless supported by botanical proof: by which means, only, can fact rather than opinion become the basis of argument. Taxonomically, *nomina nuda* are invalid: so, too, should be *interpretationes nuda*.

DILLENiaceæ

Wormia and Dillenia

These genera are now often treated as one though their differences are maintained for subgenera. No one, however, has shown that there are species of intermediate character, and the sole reason for uniting them, it seems, is to facilitate the making of new species on insufficient material, because without ripe fruits it is not possible to assign a species with certainty to its genus. On the other hand, the fruit-mechanism of the two genera is very different and has a biological value readily appreciated by the naturalist. The seeds of *Wormia* are dispersed by birds, which take no cognisance of *Dillenia*-fruits, and *Dillenia*-seeds are dispersed by mammals or by chance, as by floating down stream. The field-botanist will like the significance of the two genera and, as I see no necessity to capitulate to the 'hortus siccus', I maintain the two in the sense of Hooker, King, Koorders, Valetton and Ridley.

Dillenia with its tendency to massive solitary flowers, connate carpels, indehiscent fruits with fleshy sepals, and deciduous habit is the more advanced. *W. Beccariana* appears to be the most primitive species.

Dillenia meliosmæfolia Hook. f. and Th., F.B.I., I, 1872, p. 36.

= *Wormia meliosmaefolia* King, Mat. Fl. Mal. Pen. I, 1889, p. 365.

= *Wormia parviflora* Ridley, Journ. Roy. As. Soc. Str. Br. 54, p. 6. Fl. Mal. Pen. I, p. 9.

= *Dillenia Elmeri* Merrill, Univ. Calif. Publ. Bot. 15, 1929, p. 195.

This species was based on a collection of Griffith's from Malacca. It was transferred to *Wormia* by King and returned to *Dillenia* by Ridley who first described its indehiscent fruits and exarillate seeds. It is a *Dillenia* with small solitary, or paired, flowers with yellow petals and 7-10 carpels, slender very hairy pedicels and stouter peduncle (when the flowers are paired): the leaves are medium to large, narrowly oblong obovate, varying from coarsely dentate to subentire, with cuneate base, canaliculate, but not winged, hairy petiole, 12-20 pairs of side-veins which are more or less hairy beneath and excurrent in the teeth, and with rather coarse fig-like reticulation: the twigs, too, are very hairy but glabrescent when old, the hairs turning yellow in drying. As such it is an easily recognised species, well delimited from all other Malayan species, yet like these others it is decidedly variable especially in dentation of the leaf-margin and in hairiness.

W. parviflora was described by Ridley in the same paper as he transferred *W. meliosmaefolia* back to *Dillenia*, yet I find *W. parviflora* identical in all respects with specimens of *W. meliosmaefolia* named by King (King's Collector 4779, 5787), who was the first to expound Hooker and Thomson's species. *W. parviflora* was based on Curtis 3489 and Derry 1077, both from Malacca (the type-locality of *D. meliosmaefolia*); there are 5 sheets of the first and one of the second at Singapore: Curtis 3489 and Curtis 2311 had already been identified as *D. meliosmaefolia* by King. I am unable to account for Ridley's species because I can discover no difference from *D. meliosmaefolia*.

The type-collection of *D. Elmeri* is Elmer 21028 (B. N. Borneo), a specimen of which is at Singapore. It differs from the Malayan *D. meliosmaefolia* only in the glabrescent leaves and twigs and rather shortly hairy sepals. Otherwise it has all the characters of *D. meliosmaefolia*, as just noted, and no others. Nor can I discover any discrepancy in Merrill's description. I therefore reduce it but with the reservation that when more collections are known, it may prove to be a glabrescent variety such as one finds in *W. excelsa*. Forbes 1607 is just such a state from Sumatra.

Typical *D. meliosmaefolia* is known also from Sarawak, (Omar 82) and Sumatra (B. Kloss 14083, Krukoff 4047, Bartlett 6616 and 7055). It is a species of the Sunda-shelf.

Wormia Beccariana (Martelli) Ridley, Saraw. Mus. Journ. I, 1913, p. 71.

= *Dillenia Beccariana* Martelli, Malesia III p. 158.

= *Wormia albiflos* Ridley, F.M.P. 1 p. 9.

The distinguishing features of this species are the many-flowered, pendent, zig-zag inflorescences, the white petals, the five densely hairy carpels and the petiolar wing distinct from the lamina. A type-specimen of *W. albiflos* (Ridley 11053) is in the Singapore Herbarium. I have found the species commonly in the East of Johore and collected it from Ridley's type-locality (Kota Tinggi). For the identification of these Malayan specimens with Martelli's species I have to thank Mr. C. E. C. Fischer who has compared them with specimens of Beccari's 134,497, 3076 (syntypes of *D. Beccariana*) in the Kew Herbarium. Mr. Fischer remarks that Beccari's specimens have much more pronouncedly zig-zag inflorescences and far more densely yellowish setose carpels but concludes that the differences are varietal and that the two species should be united. No other species of *Wormia* or *Dillenia* is known with these peculiar characters. That the species belongs to *Wormia* I have been able to ascertain from a recent collection (Kiah, S.F. No. 32016, Johore) which shows the

typical dehiscent, star-like fruit; unfortunately I have not found the living fruits myself and can give no details of their colour or the nature of the aril. Ridley ascribes yellow petals to *W. Beccariana* but, surely, in error.

W. Beccariana is a plant that indicates the past connection that occurred between Malaya and Borneo. It is restricted to the East of Johore in the watersheds of the Endau, Sedili and Johore, where it is common, and to Sarawak. It certainly does not occur on the West of Malaya, which has been sufficiently well-collected in the lowlands to ensure that such a striking plant could not have been overlooked, and one can say, confidently, that it never occurred in Singapore, unlike *W. excelsa* var. *tomentella*. Why it is so limited in Malaya, I do not understand: it grows in swampy forest, lowland hillside forest and in belukar. It may occur in South Pahang, but very little is known botanically of this transitional region of Malaya.

Wormia excelsa Jack, Mal. Misc. 1822, p. 123: haud Hook. f. & Th., Fl. Ind. 1855, p. 67.

= *Capellia multiflora* Bl., Bijdr. 1825, p. 5.

= *Wormia oblonga* Hook. f. & Th., loc. cit.

= *Dillenia excelsa* (Jack) Gilg, Engl. & Prantl. Pfl. vol. III, 6, 1895, p. 123: quoad nomen, haud quoad descriptio.

W. excelsa Jack is a species described from Bencoolen in Sumatra. It seems that the type-specimen, if there ever was such, was destroyed.

Hooker and Thomson were the first to take up Jack's species but they misinterpreted it by referring to it specimens of *W. suffruticosa* (vide F.B.I. p. 35: King, Materials Fl.M.P., I, p. 8). In the same work, Hooker and Thomson described *W. oblonga* as new, and gave a description that agreed exceedingly closely with Jack's *W. excelsa*. Later (F.B.I. I, p. 35) Hooker remarked under *W. oblonga*, "Very near *W. excelsa*, Jack." King (Materials, loc. cit) and Ridley (F.M.P. I, p. 9) followed Hooker's interpretation of the specimens from Malaya, calling them *W. oblonga* and disregarding Jack's species.

The only difference between Jack's description of *W. excelsa* and the Malayan species, which is a fairly common tree and many specimens of which are now to hand for comparison, is that Jack gives "Peduncles many flowered" and the Malayan species has only 3-6 (rarely 7) flowers on the raceme. It might be suggested that Jack would have written "few-flowered", had his specimens no more than 6 flowers, but it is clear that Jack was contrasting *W. excelsa* with *W. pulchella*, which he described immediately after, and which has solitary flowers; the expression

“many-flowered” would thus be reasonable for such a few-flowered inflorescence.

De Vriese (Pl. Reinw. 1856, p. 79, v. VI-VII) next took up *W. excelsa* after Hooker and Thomson. His description and figure agree with *W. oblonga* and clearly do not refer to *W. suffruticosa*. But the inflorescence, as shown in the figure, has 9-13 flowers and looks more like that of *W. suffruticosa*, though the leaves are exactly like those of *W. oblonga*. I doubt the accuracy of the drawing of the inflorescence.

Miquel (Fl. Ind. Bat. I pt. 2, p. 10) added nothing of descriptive value.

Koorders and Valetton (Bijdr. I, Booms. op Java 1894, p. 168) interpreted *W. excelsa* as a species that, from their description, is identical with *W. oblonga*: they give “racemi sæpe 2-5 flori”. Their interpretation has been followed by other botanists in Java; and Sumatran and Bornean specimens distributed from Buitenzorg as *W. excelsa* are identical with *W. oblonga* of Malaya.

Gilg (loc. cit) misinterpreted *W. excelsa* by placing it in the section *Euwormia*, which has all the stamens erect and more or less of equal length. Jack clearly stated that the inner stamens were longer than, and curved over, the outer stamens.

I conclude that the Dutch botanists should be followed in their interpretation of *W. excelsa* Jack and that *W. oblonga* should be reduced to a synonym.

As regards *Capellia multiflora* Bl., Hooker and Thomson reduced it to *W. excelsa* in their Flora Indica (1855) but because they also confused *W. suffruticosa* with *W. excelsa* it is impossible to decide from their work to which species Blume’s should be referred. Accordingly I asked Dr. S. J. van Ooststroom, of the Rijks Herbarium at Leiden, to investigate Blume’s specimens. Dr. van Ooststroom found three specimens numbered “Blume 1687” which represent the type of *C. multiflora*. They are not *W. suffruticosa* but clearly, from the drawing kindly supplied by Dr. van Ooststroom, they are *W. excelsa*. I express my indebtedness to Dr. van Ooststroom for having settled this point.

The essential diagnostic points of *W. oblonga* were all recorded by Jack for *W. excelsa* thus: “Leaves. elliptic ovate to elliptic-oblong, acute, denticulate or obsoletely serrate. 8-12” long. Petioles deeply channelled above Pedicels alternate, clavate. Flowers large, yellow, 3 inches in diameter. Stamina. outer ones yellow shorter than the inner, which are purple, erect and recurved above. Ovaries 6-8. capsules 6-8, whitish, semi-transparent. Seeds. enveloped in a red aril”.

Another species of the Sunda Shelf that combines these characters of *yellow flowers*, *purple stamens* and *white fruits* has not been recorded.

As thus delimited I find that *W. excelsa* is a variable plant. While the flowers, inflorescences and fruits retain their constant characters, the leaf-blade varies from elliptic with rather suddenly narrowed base to oblong obovate with narrowly cuneate base, and in texture from thin to distinctly coriaceous: the leaf edge varies from almost serrate to very finely denticulate with minute shrivelled points scarcely visible to the naked eye, and even entire: the leaves and twigs may be glabrous or sparsely puberulous or distinctly adpressedly hairy on the petioles and undersides of the main veins as on the twigs: the sepals are generally villous, but may be sparsely puberulous and even glabrous.

The typical state of *W. excelsa*, in the taxonomical sense, I take to be that with rapidly glabrescent leaves, twigs, inflorescences and sepals so that the mature parts are glabrous. Jack made no mention of hairiness in his description of *W. excelsa*, nor in that of *W. pulchella*, which is invariably glabrous; and, as Jack was always careful to note matters of hairiness in his excellent descriptions, one may safely conclude that his specimens were glabrous: had they had the hairy sepals or leaves of the two varieties, which I propose, he could not have failed to have noticed them. Further, neither de Vriese, nor 'Koorders & Valetton' indicate hairiness of sepals; of the leaves they write glabrous; and I think that they would not have omitted such points, had they been present in their specimens.

From this basis I make the following classification, but not without the reservation that there are intermediate states connecting the varieties and the typical state.

W. excelsa Jack

Twigs, petioles, leaves, inflorescences and sepals sparsely adpressedly hairy when young, soon glabrous or glabrous from the first: leaf-blade more or less distinctly toothed to almost or quite entire.

MALAYA: JOHORE, For. Dept. 12061; Corner 29335; Corner s.n. 27.7.32.

SUMATRA: Herb. Hort. Bot. Bog. bb. 17484; bb. no. E. 981, bb. no. 201E Bartlett 6597.

BORNEO: Elmer 20051 (B.N.B.).

Elmer 21159 (B.N. Borneo) may be placed here as it has the leaves of *W. excelsa* and glabrous inflorescences and sepals, but the young twigs are as hairy as in the next variety: it is an intermediate state.

var. **pubescens** var. nov.

= *W. oblonga* Hook. fil. et Th.

Pedunculis, pedicellis et sepalis adpresse sericeo-hirsutis: *sepalis saepe subtomentosis*: pilis siccis fulvis: laminis dentatis vel denticulatis raro subintegris.

MALAYA:—

KEDAH, Ridley 5370;

PENANG, Curtis 257;

PROVINCE WELLESLEY, For. Guard 12625;

PERAK, Curtis 3184, Wray 735, Derry C. 257, Corner 31510, Ridley 14083;

SELANGOR, Strugnell 13955, Ridley 13388, Hamid C. F. 602,

Goodenough 10623, Hume 8322;

NEGRI SEMBILAN, C.F. 0588, 1984;

MALACCA, Alvins 353, Goodenough 2005, Derry 1025 and 46;

PAHANG, Ridley 2625, 2637, Walker 14153, Hamid C.F. 5166, Kalong 20469, Burkill 16856.

SUMATRA: Posthumus 1025.

BORNEO: Boden Kloss 19089: For. Dept. B.N.B. 4565.

This is the commonest state of the species in Malaya. Both Hooker and King described hairy sepals for *W. oblonga*.

var. *tomentella* var. nov.

= *D. tomentella* Martelli, Malesia III, p. 159.

= *W. tomentella* (Martelli) Ridley, F.M. Pen. 1, p. 10.

Ramulis, petiolis, foliisque (pagine inferiore) *pilosotomentellis*, vix glabrescentibus: folii margine integro vel vix denticulato: pedunculis pedicellisque mox tomentellis, mox glabrescentibus: *sepalis glabris vel sparse puberulis*.

MALAYA:—

SINGAPORE, Ridley, 6382, 6809: s.n. Bandstand 1890 and

1892. C.F. Baker s.n. 15.10.17: Md. Nur 1473, 1892:

s.n. 3.9.18: s.n. 18.6.24: Symington 22979.

JOHORE, Kiah 32190.

BORNEO: Herb. Hort. Bot. Bog. bb. 16232: Haviland 1989: Carroll 7170.

The Malayan specimens referred by Ridley to *W. tomentella* Mart. are to me no more than a variety of *W. excelsa*, having hairy twigs and leaves, generally entire edges to the leaves and glabrous sepals. They have the same characteristic inflorescence, purple anthers and white fruits. I have compared dried and spirit-material of flowers and fruits of both species and can find no structural difference. Although the leaf-edge in this variety is generally entire, in Baker's collection it is distinctly denticulate and in several collections of *W. excelsa* and *W. excelsa pubescens* the edge is very finely denticulate and even entire, e.g. Ridley 5370 and 13388, Curtis 257, Derry 6257, Herb. Hort. Bot. Bog. bb. 16174. The hairiness of the vegetative parts varies considerably and it is by no means possible to distinguish this variety from typical *W. excelsa* absolutely.

It is curious that var. *tomentella* should have hairy vegetative parts and glabrous sepals, while var. *pubescens* should have glabrous vegetative parts and hairy sepals.

For the identification of these Malayan and Bornean specimens with *D. tomentella* Martelli, I have to thank Mr. C. E. C. Fischer, of Kew Herbarium, who has compared the Malayan specimens with Beccari 1193, which is a syntype of Martelli's species. Martelli described the number of carpels as 10 which Mr. Fischer corroborates, whereas they are 5-9, mostly 6-7, in my var. *tomentella*: but, as Mr. Fischer remarks, if they vary so much they may quite well go on to 10. I am inclined to think that var. *tomentella* is truly confined to W. Borneo and S. E. Malaya. It is frequent in the Reservoir Jungle in Singapore and in the watershed of the Sedili in the East of Johore. Several plants have this limited distribution e.g. *W. Beccariana*, *Pandanus epiphyticus*.

W. suffruticosa Griff.

Ic. Plant. Asiat. Pl. IV, 1854, pl. 649.

Ridley, Journ. R. As. Soc. Str. Br. 54, 1909, p. 5:
Fl. Mal. Pen. I. p. 7.

Syn. *W. subsessilis* Miq., Fl. Ind. Bat. Suppl. I, 1860, p. 619 (fide King in Mat. Fl. Mal. Pen. I, p. 8).
Ridley loc. cit. (1909) p. 4.

W. subsessilis var. *borneensis* Ridley, Journ. R. As. Soc. Str. Br. loc. cit.

W. suffruticosa var. *borneensis* Ridley, Sarawak Mus. Journ. I, 1913, p. 71.

Ridley has endeavoured to distinguish *W. subsessilis* from *W. suffruticosa*, while other authors follow King and unite them. In order to decide the point, I have made a special study of the species in Singapore and in South Johore, having made expeditions to the Sedili River in Johore purposely to compare living specimens side by side.

Ridley distinguishes *W. subsessilis* by its nearly or quite glabrous young parts, by its stouter habit and larger size, by its faculty of rooting from the branches and thus of forming thickets, by its less dentate leaves with narrower base and more slender, glabrous racemes. Such a state one can distinguish from typical *W. suffruticosa* which has the young parts and racemes adpressedly white floccose and which is often a rather slender shrub. However, I have seen on the Sedili River as many plants that are intermediate in all degrees as there are typical ones and some that show different variations not remarked by Ridley. The shape, colour, size and structure of the buds, flowers, fruits and seeds are identical in all these states, forms or varieties, and therefore I have no hesitation in following King in his

reduction of *W. subsessilis*. *W. suffruticosa* thus becomes a well-characterised species of Sumatra, Malaya and Borneo, with vaginate petiole confluent with the large coarsely toothed blade, large flowers with yellow petals, cream white stamens and pink fruit, and, in habit, it is an evergreen, sprawling, dense shrub that will root from the decumbent branches. It is not a tree.

As regards the hairiness, which seems the chief distinction between *W. subsessilis* and *W. suffruticosa*, I may say that it is not difficult to find a few twigs with slightly silky young leaves and racemes on plants which are for the most part glabrous, and that plants with all the young twigs and racemes thinly floccose, so that one cannot decide to which species they should be referred, are frequent on the Sedili River. On the same plant the leaves vary in toothing and exact outline, the vigorous vegetative shoots having larger and more coarsely toothed leaves than the flowering shoots, and saplings having larger leaves still. As regards a distinction in habit, I can find no support for Ridley's statements. By the Sedili River, both glabrous and floccose forms make thickets that spread by rooting from decumbent branches.

As regards the racemes I find that some plants have simple racemes of 4-9 flowers on a flowerless peduncle 3-6" long, that other plants have racemes with 2-5 branches, each with 3-8 flowers, on a common peduncle 6-10" long and that on other plants one can find branched and simple racemes with peduncles of intermediate length, *e.g.* S.F. No. 32984. Moreover, one can find both glabrous plants with simple or branched racemes and floccose plants with simple or branched racemes, so that if one regards the hairiness and the branching of the raceme as characters of varietal rank one must make four varieties to cover the combinations of the two characters. Even so, many plants will be found that are intermediate between the varieties. An intensive and extensive study of the species will reveal, no doubt, a dozen possible varieties to name which seems purposeless.

Ridley has made a variety *borneensis* of *W. subsessilis*, from "Borneo, Sarawak: in swamps at Kuching abundant". He later transferred the variety to *W. suffruticosa*. There is no exact typification but in the Singapore Herbarium there are two sheets which must undoubtedly have been the basis of Ridley's variety. Their labels are written in his hand. The collections are:—

- (a) "Kuching July 1899 nr. *suffruticosa* but flrs. much larger, fruit white".

This sheet consists of a large glabrous leaf without petiole and some flower buds.

- (b) "J. Hewitt, Kuching 1909. *Wormia suffruticosa* var. *borneensis*".

This sheet consists of two twigs each with a leaf and flowering racemes, and some flower buds in a packet.

Sheet (b) has adpressedly floccose young leaves, twigs and racemes and coarsely dentate leaves, as stated in Ridley's description of var. *borneensis*. It is identical with *W. suffruticosa* in Malaya. As for the flower size, Ridley says (loc. cit. p. 3) the flowers of var. *borneensis* are bigger than those of *W. subsessilis* and *W. suffruticosa* but, on pp. 4 and 5, he gives the flowers of *W. subsessilis* as 5" wide and those of var. *borneensis* as "4" across or more". The normal variation in *W. suffruticosa* I find to be 4-5", and the flowers and buds on the sheets (a) and (b) are the same size as those of *W. suffruticosa* when dried.

As regards the colour of the fruit of var. *borneensis*, which is described as white, there is only the evidence of the note on the field label of sheet (a). Who made the note? May not the whiteness refer to the white edges of the dehiscent carpels, or to an old bleached fruit? I consider var. *borneensis* a myth.

ANNONACEÆ

Anaxagorea

A. Scortechinii King

Mat. Fl. Mal. Pen. No. 4, vol. I, 1892, p. 69.

Ann. Roy. Bot. Gard. Calc. IV, 1893, p. 85, pl. 119.

There can be no doubt that this species is *A. javanica* Bl. Boerlage suggested its identity in 1889 (Ic. Bog. vol. I, 2nd fasc., p. 110). I find that *A. Scortechinii* in Malaya is variable in a manner not yet described. Apart from differences in leaf-size, which are considerable, the number of flowers on the inflorescence (1-several) and the size of the fruit, some specimens have six petals, others three, and others two. Those with six petals have the inner three considerably smaller than the outer three, as Blume described and figured for *A. javanica*. Those with three petals have only the outer row, the inner being absent. Those with two petals have no inner row of petals and they have only two sepals. In leaf, flower-shape, colour, structure and size, and in fruit-characters, these three states are identical. It is nevertheless desirable to distinguish two as varieties (*tripetala* and *dipetala*) from the hexapetalous type.

The distinguishing marks of the species are the rather broad, many-veined leaves, the inflorescences on the leafy twigs, the thick, fleshy petals, the circle of sterile stamens

round the carpels which they overtop with outcurved ends, and the numerous carpels of which 4–10 develop into fruits.

The diagnostic specimens from Malaya are as follows:—

A. javanica Bl. Fl. Jav. Anon. (1828), p. 66, t. 32 and 36A.

Six petals in two whorls.

KEDAH: Curtis 2644;

KELANTAN: Henderson 29534 (det. *A. ?luzonensis*): Nur 11954;

TRENGGANU: Corner 30215;

PAHANG: Henderson 10656, 22483: Holttum 20529 (all det. *A. luzonensis*);

SINGAPORE: Botanic Gardens, s.n. (several collections).

Curtis 2644 was named *A. Scortechinii* by King though it has six petals. King evidently overlooked this point.

✓ **A. javanica** var. **tripetala** var. nov.:

= *A. Scortechinii* King loc. cit.

petalis interioribus deficientibus.

PERAK: Henderson 23788 (*Type-collection*: type-specimen in Herb. Singapore): Haniff & Nur 6951: Ridley 14734: Wray 3400.

SELANGOR: Hume 8390.

BORNEO: Elmer 21131 (Tawao, B.N.B.).

King did not indicate a type, or a numbered collection, for *A. Scortechinii*. Presumably the type would be Scortechini's collection, no specimen of which is at Singapore. I am therefore obliged to define anew this tripetalous entity.

✓ **A. javanica** var. **dipetala** var. nov.

sepalis 2: petalis 2, interioribus deficientibus.

JOHORE: Corner 28972 (*Type-collection*: type specimen in Herb. Singapore): 29464: s.n. 9.2.35: s.n. May, 1935.

These four collections come from two tributaries (S. Berassau and S. Kayu Ara) of the Sedili River (S. Sedili) in the East of Johore. The variety is common there, but I have not found either of the other states with it. The collection, s.n. May 1935, has very large fruits, the follicles being 4.8 cm. long, 1.2 cm. wide at the apex, and the seeds measuring 1.7 cm. long. Whether such big fruits are also distinctive of the variety, I do not know.

A. luzonensis A. Gray

There is no reliable evidence that this species occurs in Malaya. The simple diagnosis of 6 petals for *A. luzonensis* and 3 for *A. Scortechinii*, given by King, does not hold and has led to the wrong identification of several Malayan collections.

A. luzonensis differs from *A. javanica* in having thinner, subequal petals, a much more open flower, no

sterile stamens round the carpels, only 1–3 carpels (rarely 4) of which only 1–2 set fruit, and a spike-like style at the end of the follicle, as well as in the smaller leaves (apparently not exceeding 6.5 cm. wide) with fewer pairs of side-veins (6–8: in *A. javanica* 8–12).

Goniothalamus

G. malayanus Hook.f.et Th. and **G. Tapis** Miq.

The only difference that I can find between these two species, as the names have been applied to the Malayan specimens by King and Ridley, is that *G. Tapis* has round or ovoid, 1-seeded fruiting carpels whereas *G. malayanus* has larger, oblong 2–3 seeded fruiting carpels. I believe, however, that there may be differences in the size, colour and shape of the petals, but these points cannot be made out with certainty, if at all, from dried specimens of 'open-budded Anonaceæ' because it is impossible to decide whether the flower is really full grown. The leaves are variable in size, shape and texture regardless of the characters of the fruit. A study of living specimens will be needed to determine their specificity.

Canangium

C. odoratum (Lam.) Baill.

This species appears to be very widely distributed in the wild state. It is said to be indigenous in Burma, Java, the Moluccas and the Philippines. Ridley says that it is not wild in the Malay Peninsula (F.M.P. I, p. 43), but this is a mistake, as I will presently show. In the Singapore Herbarium there is a specimen from Celebes, evidently from a wild tree, and another from the rain-forest of North Queensland (Brass No. 2258). I have no doubt that it is wild throughout the range of the lowland rain forest from N.E. India to New Guinea and N. Australia. *C. odoratum* is thus a species the distribution of which defines what is undoubtedly the extent of the flora of the Malay Archipelago in its fullest sense. It is such far-flung and easily distributed plants that one should take to indicate the major regions of Plant Geography.

The 'Kenanga utan' of Malaya is the wild form of the species in the Malay Peninsula. It is very common in secondary jungle, at the edge of the forest and by stream and river-banks in the forest from Negri Sembilan northward to Kedah and Kelantan. It differs from the cultivated Kenanga in having rather rank-smelling flowers and, apparently, smaller fruiting carpels containing fewer seeds

and more numerous carpels to the flower. In habit it is also more upright with less drooping branches but such features are probably caused by its growth in the jungle. In leaf, flower, bark, and fruit- and seed-structure, the wild and cultivation forms are identical. I have compared living and preserved material side by side. How Ridley overlooked the 'Kenanga utan', I do not understand. If it is regarded as an 'escape' in Malaya, then it is very remarkable 1. that there should be hundreds of wild trees at the edge of the forest by the railway from Kuala Lipis to Kuala Krai, where there is scarcely a cultivated tree; 2. that it should be absent from the south of the Peninsula where there are plenty of cultivated trees. Moreover, if one cannot accept the present occurrence of the 'Kenanga utan' in Malaya as that of a wild plant, it will surely be impossible to prove its wild status in any country.

C. Scortechinii King, Mat. Flor. Mal. Pen. I, 1892, p. 291.

Type Collection:—Scortechini, Perak.

A sheet of the type-collection is in the Singapore Herbarium. The specimen has only small, half grown leaves near the ends of the twigs and a few, very young flower-buds. I have no doubt that all the mature leaves and full-grown flowers fell off in the press, as generally happens with the Kenanga unless it is dried very rapidly on the day of collecting. I can see no difference from similarly prepared specimens of Kenanga and therefore I reduce *C. Scortechinii* to *C. odoratum*.

King says that *C. Scortechinii* differs from *C. odoratum* in having smaller leaves, a different inflorescence, with smaller, quite inodorous flowers. It is also a smaller tree. King gives the leaves as 2.5" long but quotes Scortechini as giving them 3-7" long (as I have just suggested, the old leaves probably fell off in the press). Concerning the inflorescence I can discover no difference from *C. odoratum* either in the specimen or in King's descriptions. The flowers on the specimen are smaller than those of *C. odoratum* because they are very young, which King also notes: for this reason also they have short pedicles. In distinguishing *C. Scortechinii*, neither King nor Ridley seem to have been aware of the fact that the flower-buds of *C. odoratum* open long before the flowers are full grown, when the petals are no longer than the sepals and the pedicels are still short: as the flower grows, so petals and pedicel lengthen until the flower turns yellow, ripens and becomes fragrant. That the flowers of the type of *C. Scortechinii* were immature is shown by King's remark on their absence of smell, which doubtless was taken from Scortechini's field notes. The size of the tree is no

indication of specificity. The cultivated Kenanga may begin to flower when 8 ft. in height and subsequently grow to 80 ft.

I conclude that *C. Scortechinii* was based on imperfect specimens of *C. odoratum* with immature flowers.

C. fruticosum Craib, Kew Bull. 1922, p. 166.

"*C. odorato* (Hook. f. et Thoms.), simile sed habitu humiliore, foliis basi sæpissime cuneatis, pedicellis longioribus differt".

From the description there is no specific difference between *C. fruticosum* and *C. odoratum*. The habit of "frutex 3-4-metralis" for *C. fruticosum* suggests the dwarf variety of *C. odoratum* which is cultivated in Malaya. This dwarf-variety is a shrub reaching 6 ft. high that flowers throughout the year, often has supernumerary petals ('petala sæpissime 6, rarias 8...', *C. fruticosum*) and never sets fruit (fruits not mentioned for *C. fruticosum*). The shape of the leaf-base varies greatly in *C. odoratum*, even on the same tree, from cuneate to cordate. The length of the pedicels in *C. odoratum* varies according to the age of the flower and the position of the flower on the twig and the inflorescence: the uppermost flowers on the inflorescence often have shorter pedicels than the lower in which they may reach 8 cm. long (only "usque ad 5 cm" for *C. fruticosum*!), and the inflorescences from the upper leaf-axils on a twig often have more shortly-stalked flowers. I do not find that Craib, either, has considered the peculiar development of Annonaceous flowers.

As it is convenient to have a botanical name for this dwarf Kenanga, I reduce *C. fruticosum* Craib to a variety of *C. odoratum*, namely *C. odoratum* (Lam.) Baill. var. **fruticosum** var. nov.

CAPPARIDACEÆ

Cratæva

I have had great difficulty in identifying the Malayan species. It seems that most of the Asiatic and Polynesian species are very imperfectly known. King has credited the Malayan flora with *C. macrocarpa* Kurz and *C. hygrophila* Kurz (Mat. Fl. Mal. Pen. I, 1889, p. 42). Ridley has given *C. macrocarpa* Kurz and *C. religiosa* Forst. (Fl. Mal. Pen. I, 1922, p. 125). Craib has given *C. macrocarpa*, *C. hygrophila* and *C. Nurvala* Ham. (Fl. Siam Enum. I, 1925, p. 85). And, most recently, Burkill has given *C. macrocarpa* and *C. Nurvala* (Dict. Ec. Prod., 1935, p. 676). According to the key and diagnoses of Kurz (Journ. Bot. 1874, p. 194) and the descriptions of Gagnepain's which are the most

recent that I can find (Fl. Gen. Indoch. I, 1908, p. 177), the wild Malayan specimens in the Singapore Herbarium belong to *C. macrocarpa* and *C. lophosperma* Kurz. That *C. religiosa* (of India), *C. Nurvala* or *C. hygrophila* is wild in Malaya, there is yet no evidence. *C. Roxburghii*, however, has been introduced to Malacca.

The important points to note in *Cratæva* are the shape, venation and stalk of the leaflets, the number of stamens and whether they are united or not, the shape and structure of the ovary (1- or 2-celled), the shape of the fruit and the size, colour and surface-markings of the seed: perhaps, too, the colour of the petals and the density of the inflorescence.

Our two wild Malayan species, which for argument I will call A and B, are distinguished this way:—

Cratæva A (*C. lophosperma*)

Leaflets 6–20 × 2.5–7.5 cm., lanceolate to ovate-elliptic, apex attenuate-acuminate, subcoriaceous, subglaucous beneath, distinctly and closely reticulate on both surfaces of the dried leaf: *primary lateral veins* 13–19 pairs, crowded: *petiolules* 3–9 mm. long, distinct: *petals* white then cream buff: *stamens* 24, or as few as 18, the others being more or less abortive, not joined at the base: *ovary* oblong elliptic or subcylindric, clearly 2-celled through the meeting of the 2 marginal placentas along the axis, their broad ends closely apposed: *fruit* 4–5 × 3–4.5 cm., broadly elliptic: *seeds* 11–13 mm. wide, deeply reniform, dark grey brown to cinereous blackish (herb. spec.), verrucose along the rather narrow, 1–3 mm. wide, often crested, outer convex border: *habitat*, stream banks and open woods on sandy soil, in the north-eastern part of Malaya.

Cratæva B (*C. macrocarpa*)

Like *Cratæva A* but:—

Leaflets 9–27 × 4–11 cm. relatively broader, ovate elliptic, membranous though becoming ± coriaceous in fruiting plants, not glaucous, reticulations wide and generally faint on both surfaces: *primary lateral veins* 7–10 pairs, fewer, widely-spaced: *petiolules* 0–2 mm. long, the leaflets generally sessile: *stamens* 10–16, fewer, often slightly joined at the base: *fruit* rather larger, 6–7 × 5–5.5 cm.: *seeds* light brown (herb. spec.) with a rather broad, 3–5 mm. wide, densely verruculose, convex outer border: *habitat* in very swampy ground, in the middle and south of Malaya.

As regards *Cratæva B*, according to the key and descriptions of Kurz, it should be *Cratæva macrocarpa* except that Kurz has attributed a 1-celled ovary to his

species. The specimen of *Crataeva B*, Wray 3348 (Perak), King has identified with *C. macrocarpa*, presumably by comparison with Kurz's type (Maingay 125, Malacca). King described the ovary of *C. macrocarpa* as having 2 parietal placentas and he corrected Kurz's description of the seeds as smooth (unripe) to "shortly tuberculate along the edge". According to Gagnepain's key, *Crataeva B* is also *C. macrocarpa* but Gagnepain has described it with 20 stamens. Both Kurz and King emphasized the fact that *C. macrocarpa* had no more than 15 stamens. There are later collections of *Crataeva B* from Malacca, the 'type-locality' at Singapore, but none of *Crataeva A*. I am convinced, therefore, that *Crataeva B* is *C. macrocarpa*, however the name has been misunderstood.

As for *Crataeva A*, it cannot be identified in Kurz's key unless one allows the fruit of *C. lophosperma* to vary from globose to ellipsoid, in which case *Crataeva A* agrees exactly with *C. lophosperma*. (Kurz described the 2-celled fruit). This is also Gagnepain's interpretation of *C. lophosperma*. I therefore identify *Crataeva A* with *C. lophosperma*.

Most of the specimens identified with *C. macrocarpa* in the Singapore herbarium are *C. lophosperma*. The two species have been confused by Ridley and Burkill. As the flowers of *C. lophosperma* have never been described, and I was fortunate enough to find a tree in flower at Tumpat in Kelantan, during April 1937, (S.F. No. 33444), I can give the following description:—

Inflorescence: a large, rather dense, erect, many-flowered, corymbose raceme, reaching 30 cm. long, 26 cm. wide across the open flowers: *bracts* lanceolate, caducous, 3–4 mm. long, green: *peduncles* 2.5–6.5 cm. long green: *sepals* 2–3 mm. long, ovate, acute or subacuminate, tiny, green: *petals* 3 cm. long, 1.5–2.0 cm. wide, the stalk 4–6 mm. long, ovate, subacute, the upper two slightly larger than the lower two, white then cream-buff: *stamens* 18–24, nearly or quite as long as the gynophore, not joined at the base, the filaments purplish, the anthers 2.5 mm. long and brownish with deep orange pollen: *gynophore* 6.5–8 cm. long, purplish: *ovary* 4.5×2.5 mm., subcylindrical, slightly constricted at top and bottom, green, capped with the convex, entire, minutely papillate stigma, internally completely divided into 2 cavities by the meeting of the blunt edges of the 2 parietal placentas along the axis of the ovary, the placentas not coalescent: *receptacle* 9 mm. wide, with a tumid, arcuate, transversely rugose, green ridge between each sepal, making an arcuato-quadrate torus: flowers not or scarcely fragrant.

The questions now arise whether *C. Nurvala* is *C. lophosperma* and whether *C. macrocarpa* is *C. membranifolia* Miq. Taking *C. Nurvala* first, according to Kurz and Gagnepain it has ellipsoid, 2-celled fruits, like *C. lophosperma*, but small smooth seeds 5–6 mm. wide. That it is very similar to *C. lophosperma*, Gagnepain has admitted and such is evident also from Rheede's description and figure of *Niirvala* (Hort. Malab. III, t. 42): Rheede, however, described the flowers of *Niirvala* as white, the fruits as "intus quadripartita" and the seeds as "flavescentia". I do not think that one can overcome the discrepancy about the seeds by supposing that only immature seeds of *C. Nurvala* have been described, though it is impossible to say how far the several descriptions of *C. Nurvala* are severally original or copied. Gagnepain has placed *C. Nurvala* and *C. Roxburghii* as varieties of *C. religiosa*, but according to Alston *C. Roxburghii* has dull orange petals (Handb. Fl. Ceyl. Suppl., 1931, p. 13): and small smooth, black seeds and a unilocular ovary are attributed to *C. Roxburghii* by Kurz, Gagnepain, Trimen (Fl. Ceyl. I, p. 59) and Hooker (Ic. Pl. II, t. 178) (see below). It seems therefore that there are 3 distinct species *C. Roxburghii*, *C. Nurvala* and *C. lophosperma*, the index to which is at present by their seeds. Hence, one may confidently say that *C. Nurvala* described by Koorders and Valetton with large tuberculate seeds must be *C. lophosperma* (Bijdr. Booms. Java IV, p. 266).

Concerning *C. membranifolia* nothing more has been published than Miquel's description (Fl. Ind. Bat. Suppl. I., 1860–62, p. 387) and King's hazard that it might be *C. macrocarpa*. From Miquel's words "Foliola brevissime petiolulata....membranacea, basi....quasi decurrente, lateralia ovato-elliptica....stamina 15?, plurave?" King's suggestion appears very probable. Gagnepain attributes coriaceous leaves to *C. macrocarpa* but I think that the young membranous foliage with the flowers becomes coriaceous as the fruit sets.

Concerning the occurrence of *C. Roxburghii* in Malaya, there are two sheets in the Singapore Herbarium which appear to be referable to the species, namely Ridley 3314 (Tanjong Kling, Malacca) and Holtum s.n. 20.8.32 (Residency Garden, Malacca). They represent a species abundantly distinct from the two foregoing in the smaller size of all the parts, excepting the sepals and anthers, the round fruit, the unilocular ovary and the smooth seeds. The following are the details of this species:—

Petioles 3–10 cm. long; *leaflets* 4–9 × 2–4.5 cm., ovate, tapered to a long point, membranous, (? not glaucous

beneath): *primary lateral veins* 5–8 pairs: *petiolules* 3–9 mm. long, very distinct: *racemes* up to 8 cm. long: *peduncles* up to 4–5 cm. long: *sepals* 3–4 mm. long, ovate lanceolate, with a fine tapered point, green: *petals* about 1.8 cm. long, greenish white, then cream and finally yellow: *stamens* about 24, as long as the gynophore, violet pink, the anthers 3 mm. long: *gynophore* 2.5–3.5 cm. long: *ovary* 2.5 mm. long, subglobose, 1-locular with 2 short parietal placentas (not nearly meeting each other): *fruit* 2 cm. wide, globose, almost smooth: *seeds* 4–5 cm. wide, deeply reniform, smooth, black.

According to Kurz's and Gagnepain's keys, it must be *C. Roxburghii*. It agrees very well with Gagnepain's description except that the leaflets appear not to be glaucous beneath and they are not very distinctly reticulately-veined. It agrees also well with Hooker's plate of *C. Roxburghii* cited by Kurz though Hooker gives only 16–20 stamens, the sepals much more ovate and the ovary ellipsoid, (Ic. Pl. II, t. 178). Trimen, however, described a plant with larger flowers as *C. Roxburghii* from Ceylon, and to this plant Alston added "petals dull orange". Nevertheless, I refer these two specimens from Malacca to *C. Roxburghii* with the reservation that *C. Roxburghii* is variable and in need of much more accurate description than it has received. The Malacca plants have certainly been introduced to Malaya because they have not been found elsewhere in the country and Malacca has been a focus of commerce from India for many centuries. *C. Roxburghii* can be mistaken at first sight for *C. macrocarpa* but the stalked leaflets will distinguish it.

Now, in spite of the very imperfect knowledge of the differences between what seem to be some half dozen undoubtedly good species in Continental Asia, Merrill has recently identified with confidence Loureiro's two species of Capparis, *C. falcata* and *C. magna*, with *C. Nurvala* and *C. macrocarpa* respectively (Trans. Am. Phil. Soc. XXIV, pt. II, 1935, p. 172). After scrutinising Loureiro's descriptions, I have come to the conclusion that these two species of his cannot be identified with certainty, until all the Asiatic members of the genus have been critically revised and their distribution is better known, and that with the present knowledge *C. magna* is probably *C. lophosperma* and *C. falcata* is altogether doubtful. Indeed, Merrill has given no reason why he should select *C. Nurvala* and *C. macrocarpa* for identification with Loureiro's out of the five possibilities of Indo-Chinese plants (3 species, 2 varieties) given by Gagnepain and the 7 possibilities given by Kurz.

My reasons for rejecting Merrill's interpretations are as follows:—

***Crataeva falcata* (Lour.) D.C.**

identified with *C. Nurvala* Ham. and *C. religiosa* var. *Nurvala* Hook. by E. D. Merrill.

In the first place *C. falcata* may very well be *C. religiosa* as that name has been applied in India (Hooker, Beddome, Brandis). No one has yet stated what are the differences between the Asiatic specimens and the original Polynesian specimens of *C. religiosa*. Craib remarked that they were quite different but gave no reasons and he is merely quoted by Merrill as stating such. What is *C. religiosa typica* of India?

In the second place, only Loureiro's description of the fruit as oblong prevents *C. falcata* from being *C. Roxburghii*.

In the third place, what is *C. Nurvala*? Kurz was the first to interpret it and he referred to it a plant with *bilocular* ovary from N. E. India and Burma, as well as Rheede's *Niirvala* the fruit of which was described as "intus quadripartita". Loureiro described his *C. falcata* as "Bacca . . . 1-locularis". *C. Nurvala*, as interpreted by Koorders and Valetton is *C. lophosperma*, as I have just shown, which cannot be *C. falcata* on account of its warted seeds, unless one supposes *C. falcata* to have been described from immature seeds.

In the fourth place, Gagnepain has suggested that *C. falcata* might be *C. erythrocarpa*. Merrill has not refuted this possibility.

In the fifth place, the description of *C. unilocularis* Ham. ex Don reads just like that of *C. falcata*. But what is *C. unilocularis*, for Kurz's interpretation reads rather differently from Don's?

In the sixth place, Squires 210 from Hue (Loureiro's place of residence), identified by Merrill with *Crataeva religiosa* and *Capparis falcata*, is *C. lophosperma*.

***Crataeva magna* (Lour.) DC.**

identified with *Crataeva macrocarpa* Kurz by E. D. Merrill.

What is meant by *C. macrocarpa*, Merrill has not explained. It is important that this should have been done because, as I have just shown, *C. macrocarpa*, which is based on a Malaccan specimen, has been consistently mistaken by Malayan botanists of this century for *C. lophosperma*. Merrill himself has misidentified Squires 210 and 854, which are *C. lophosperma*. The important points in Loureiro's description are "Foliis lanceolatis. . . . Filamenta 24. . . .

Bacca subrotunda.....1-locularis.....seminibus....cortice punctato, aspero, cinereo-viridi”.

As I have just shown, *C. macrocarpa* has ovate leaflets, not more than 16 stamens, a bilocular ovary, broadly ellipsoid fruit and pale brown seeds. If *C. magna* were *C. macrocarpa*, Loureiro made the unlikely omission of the membranous and sessile character of its leaflets besides miscounting the stamens, on which point he was accurate e.g. *Rhizophora*. On the other hand, *C. lophosperma* has lanceolate leaflets (at least on the flowering twigs), 24 stamens, and cinereous seeds, though its ovary is 2-locular and its fruit ellipsoid. According to Kurz's key, *C. magna* would be *C. tumulorum* Miq. How then can one agree with Merrill's conclusion that “there is no longer even reasonable doubt as to the identity of *Capparis magna* Lour. with *Crataeva macrocarpa* Kurz”?

Specimens Examined

Crataeva lophosperma Kurz.

INDO-CHINA: Squires 210 (det. *C. religiosa*), 854 (det. *C. macrocarpa*).

SIAM: Forest Dept. F.M.S. 3858 (det. *C. macrocarpa*).

MALAYA: Corner 33444: Haniff & Nur 10194 (det. *C. macrocarpa*): Henderson 19624, 29613 (det. *C. macrocarpa*): Holttum 15226 (det. *C. macrocarpa*): Hose 34 (det. *C. macrocarpa* and *C. hygrophila*): Lambak 3167 (det. *C. macrocarpa*): Ridley 5046, 14667, 15205, s.n. River Tahan 1891 (det. *C. macrocarpa*): Seimund 54 (det. *C. macrocarpa*), 948 (det. *C. religiosa*).

BORNEO: Winkler 2742 (S.O. Borneo), indet.

Crataeva macrocarpa Kurz.

MALAYA: Alvins 534; Corner s.n. Johore 1932: Fielding s.n. Malacca 1892: Fox s.n. Pahang 1893: Goodenough 31 (det. *C. religiosa*), 1709, 1779 (det. *C. Roxburghii*): Haviland s.n. Pahang 1890 (det. *C. religiosa*): Jaamat 16508 (det. *C. religiosa*): Ridley 7630: Wray 3348: Yeop 3175.

BORNEO: Haviland 2832 (Rejang), indet.

Crataeva Roxburghii R. Br.

MALAYA: Ridley 3314: Holttum s.n. 20.8.32 (Residency, Malacca).

HYPERICACEÆ

Cratoxylon

Before the fundamental taxonomy of the genus can be settled, Blume's species and identifications must be studied but, particularly, the early species *Hypericum cochinchinense* Loureiro (1790), *Elodea sumatrana* Jack (1822) and *Elodea formosa* Jack (1822), referred to *Cratoxylon* and *Tridesmis* by Blume, must be recognised. There are no type-specimens of these three. They were described from living plants, as shown by the colour-notes

of flower and leaf, and they were given a definite country of origin. The descriptions of Jack's species from Sumatra are so detailed that their identification should be easy when the flora of that country is better known. Loureiro's description leaves much to be desired: nevertheless I think one can prove fairly to what it must have referred.

In his commentary on Loureiro's Flora (Trans. Am. Phil. Soc. 24, pt. II, 1935, p. 268) Merrill has sought to instate Loureiro's species, as *C. cochinchinense* (Lour.) Bl., for *C. formosum* (Jack) Dyer (= *E. formosa* Jack), following the suggestion of Pierre's (Fl. For. Cochinch. 1879-1899). Merrill's identification has been taken up by Burkill (Dict. Ec. Prod. Malaya 1935) and is likely to become current. I will show now that it is untenable and, likewise, the reference of the plants described by Loureiro as *Hypericum olympicum* Linn. and *H. petiolatum* Linn. to *Cratoxylum ligustrinum*. I wish to show also that *E. formosa* Jack is misunderstood and that *E. sumatranu* Jack is unidentified.

Firstly I will state under their customary names the diagnostic characters of living plants of five out of the six species of *Cratoxylum* which must be taken into account. For the sixth, *C. racemosum* Bl., I have borrowed from the description of Koorders' and Valeton's (Bijdr. 5, Booms. op Java, 1900, 135). I use inches to facilitate reference to the early descriptions.

C. arborescens (Vahl) Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 17.

A medium-sized to lofty, *evergreen* tree: bark warm brown, *rugose-fissured* rather coarsely, *becoming thickly shaggy with dead fibrous oblong scales* when old: inner bark pale brown, waxy-amber and translucent near the cambium: *glabrous*.

Lamina 3-5 × 1-2¼", oblong-obovate to oblong-lanceolate, shortly and often bluntly acuminate, *base cuneate*, dark green, *leathery*, with numerous close, very faint or practically invisible side-veins, not glaucous: *petiole* .2-.4" long, *distinct, stout*, often almost winged, (2-3.5 mm. wide).

Panicles 3-10" long, *erect terminal*, not foliose (therefore clearly defined): *flowers* 1/3" wide: *petals blood-red*, with a lacinate or denticulate basal scale: *nectary* cucullate or simple and knob-like, greenish yellow.

Capsule .3-.4" long, covered for two-thirds of its length by the sepals: seeds winged all round, linear-oblong.

Indochina and W. Malaysia generally.

var *Miquelii* King, Mat. Fl. Mal. Pen. I, 1890, p. 86.

Lamina ¾-1½" wide, lanceolate-elliptic or oblanceolate, tapered to a rather long point, thin with the side-veins

and reticulations distinct (though faint) on the underside of living and dried leaves: petiole .05" wide, rather slender, not winged.

Sumatra, Malaya, Borneo.

C. formosum (Jack) Dyer, F.B.I. I, 1874, p. 258. (= *C. formosum* auctt.).

A small to lofty *deciduous* tree: bark as in *C. arborescens* but cinereous to greyish brown, not so coarsely ridged when young, often only fibrous-fissured, not so thickly scaly: glabrous.

Lamina 2-7 × 1¼-3", generally broadly elliptic and subacuminate but varying to narrowly elliptic with tapered acute apex, base cuneate, veins prominent and well-spaced, *not or scarcely glaucous beneath, with minute pellucid spots: petiole* ¼-2/3" long, conspicuous.

Flowers .6-.9" wide, on the bare twigs before the new leaves or behind them (*i.e.* on the old wood of the preceding season): arranged in subsessile clusters of 2-5, in some cases on a very short raceme up to ½" long, occasionally solitary, singly on short stalks ¼-½" long: petals clear pale pink, with a blunt or irregularly toothed or acute basal scale: nectaries orange-red, conical, acute, flattened on the inner face, rounded or subcarinate on the outer face.

Capsule ½-¾ × .15-.3", the sepals covering only the basal third: seeds asymmetric with a unilateral wing.

Indochina, W. Malaysia, Philippines.

C. Maingayi Dyer, F.B.I. I, 1874, p. 258.

Exactly as *C. formosum* but the lamina narrow, tapered to a point and more or less glaucous beneath, petals white (fide Ridley): (? fewer anthers on each staminal bundle): ? flowers smaller, ½" wide: ? fruit always smaller ½ × .15".

Penang, Kedah: probably also in Sumatra and Indochina, *vide infra*.

C. neriifolium Kurz, Journ. As. Soc. Beng. 41, pt. 2, 1872, p. 293.

Very like *C. Wightii* and *C. racemosum* but the lamina narrower, lanceolate or oblong-lanceolate, almost sessile with an almost sagittate base, not cuneate: ? smaller flowers.

Burma, Siam, Indochina.

C. polyanthum Korth., Verh. Nat. Gesch. Bot., 1839, p. 175, t. 36.

A medium- to fair-sized *deciduous* tree: bark very smooth and even, light buff to pale brownish yellow (reddish when wet), peeling with long and irregular or angular thin

flakes (like pieces of a jig-saw puzzle), never ridged, not fissured or flaky, but rather corky in texture: *inner bark pale emerald green*: glabrous.

Lamina $1\frac{1}{2}$ – $3\frac{1}{2}$ $\times$.7–1.8", *elliptic-lanceolate, tapered to a rather long point*, the base tapered cuneate, side-veins distinct but not prominent, *more or less glaucous beneath, not pellucidly punctate* though dotted with opaque glands: *petiole* .1–.2" long, short.

Flowers .3–.4" wide, *mostly in shortly stalked trichasia*, occasionally solitary, *in the axils of the current foliage leaves (i.e. produced on the new wood after the new leaves)*, the uppermost leaves on a flowering twig generally smaller than the lower, or in short panicles, 1–2" long, the lower branches trichasial, the upper uniflorous, and without leafy bracts, the panicles terminal or from the upper leaf-axils: *petals delicate pink* (as in Korthals' figure), *without a basal scale: nectary yellow, hooded or saccate (cucullate), opening on the outer face, large, occasionally minute, oblong and simple* (as in Korthals' figure).

Capsule .3–.4" long, ellipsoid, covered for $\frac{2}{3}$ – $\frac{3}{4}$ its length by the sepals: seeds with unilateral wing.

Northern India throughout W. Malaysia to the Philippines.

C. pruniflorum Kurz, For. Fl. Burma I, 1877, p. 84.

Exactly like *C. formosum* but with hairy leaves, twigs and flowers; *lamina* oblong-elliptic, not pellucidly punctate; nectaries cubic, truncate (not acutely conic) (*vide* Gagnepain).

Burma, Indochina, Siam.

C. racemosum Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 16.

Like *C. Wightii* but becoming a bigger tree: *lamina* longer, up to 8", the base obtuse or rounded, the apex tapered to a point, the *petiole* very short, .1" long or less: apparently with erect panicles of smaller flowers, .4" wide (petals 7–8 mm. long, staminal bundles 5–6 mm.) and with smaller capsules $\frac{1}{3}$ " long.

Java, ? Sumatra *vide infra*.

C. Wightii Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 18.

= *C. polyanthum* var. *Wightii* Dyer, F.B.I. I, 1874, p. 257.

Very like *C. polyanthum* but: a shrub or small tree to 30' high: *bark* as in *C. formosum*, greyish-brown, cracked, fissured or rugose, the inner bark yellowish amber, translucent, with yellowish gum.

Lamina $2\frac{1}{4}$ – $4\frac{3}{4}$ $\times$ $1\frac{3}{4}$ ", oblong-elliptic, generally blunt or subacute, the leaves at the ends of the twigs or

the leafy bracts sometimes tapered more or less to a point, distinctly glaucous beneath.

Flowers larger, .5-.6" wide, in terminal or axillary many-flowered racemes 2-6" long, the pedicels uniflorous but arranged in pairs, the racemes commonly with leafy bracts especially in their proximal parts and forming a loose panicle at the end of the twig, always distinct from the leafy shoots: petals light crimson, the mass of flowers appearing red.

Capsule slightly larger .4-.5" long.

Burma, Indochina, Siam. North of Malaya (Penang, Kedah, Kelantan).

(*C. polyanthum*, sepals 4-6 mm. long, petals 6-8 mm., staminal bundles 4-6 mm.: *C. Wightii*, sepals 6-8 mm. long, petals 8-10 mm., staminal bundles 7-8 mm.).

The inflorescences of *C. polyanthum* and *C. Wightii* are essentially similar but they differ in the development of the bracts, or flowering leaves, and in the arrangement of the flowers. In *C. polyanthum* the pedicels are mostly 3-flowered, in *C. Wightii* mostly 1-flowered. In *C. polyanthum* the bracts are mostly so large as to appear like slightly reduced leaves or they may be as large as the leaves themselves, and thus the twigs appear leafy with axillary flowers and only somewhat reduced leaves at their ends. But from the terminal bud, or from one in an upper leaf-axil, a short panicle, 1-2" long, with minute bracts may be developed. Such inflorescences are much better developed in *C. Wightii*, in which they are racemose (through the uniflorous pedicels) and 2-6" long: they may have minute, bladeless bracts or leafy bracts, $\frac{1}{4}$ -1" long. In *C. Wightii*, also, there is generally a distinct difference in size between the foliage leaves and those which subtend the flowers, and thus the twigs appear to end in leafy panicles with racemose branches.

It must be confessed, however, that herbarium-specimens do not always convey a good idea of the differences between the two species.

It will be seen that *C. Wightii*, *C. polyanthum*, *C. racemosum* and *C. neriifolium* are closely allied, on the one hand, through their habit of flowering on the leafy twigs at the end of their new growth, their very short petioles, their leaves not pellucidly punctate, their more deeply coloured petals without a basal scale, their large yellow cucullate, or invertedly saccate, nectaries and their ellipsoid capsules covered for $\frac{2}{3}$ - $\frac{3}{4}$ their length by the sepals. On the other hand, *C. formosum*, *C. Maingayi* and *C. pruniflorum* are closely allied through their habit of flowering from the axils of the freshly fallen leaves, through their

longer petioles, their white or pale pink, never red, petals which have a basal scale, their simply conic or knob-like orange-red nectaries and their oblong capsules covered by the sepals only in the basal third. *C. arborescens* differs from both groups in being evergreen, with upright panicles of small flowers and in its seeds which are winged all round (in the other two groups the seed has a unilateral wing).

It must be noted that all species of *Cratoxylon*, apparently, begin to mature when they are still small enough to enable one to pick the flowers from the branches. The small size of the tree is therefore not diagnostic but I am doubtful if *C. Wightii* and *C. pruniflorum* under any circumstances reach even half the size of full-grown specimens of *C. formosum*, *C. polyanthum* and *C. arborescens*.

With these facts we can now turn to the identity of Loureiro's and Jack's species.

***Hypericum cochinchinense* Lour., Fl. Cochinch. 1790, p. 472.**

The important points in Loureiro's description are:—

"Arbor mediocris, 16-pedalis.....

Folia lanceolato-ovata, obtusa.....glabra.....
sub-petiolata.....

Flos coccineus, pedunculis subquinquefloris, axillaribus.....

Nectarium glandulis 3, magnis, reclinatis.....

Capsula ovata.....

Florum succus tingit colore aureo."

In other words, a small tree flowering on its leafy twigs (with few-flowered peduncles from the leaf-axils), shortly stalked leaves, red petals (without mention of a basal scale) and large "reclinate" nectaries indicates *C. polyanthum*, *C. Wightii*, *C. racemosum* or *C. neriifolium*. The blunt leaf and red flower refute *C. polyanthum* and *C. racemosum* and indicate one of the other two. The absence of any mention of the almost sagittate leaf-base typical of *C. neriifolium*, and the description of the leaf as lanceolate-ovate indicate *C. Wightii*. Now *C. Wightii* is a very common little tree in open country and sandy heaths from the latitude of Penang to the north of Indo-China. The only doubt that *H. cochinchinense* may not be *C. Wightii* lies in the Loureiro's description of the inflorescence. But when the flowering of *C. Wightii* is beginning, as I have seen from many trees in Kelantan and Kedah, the first formed inflorescences are "pedunculis subquinquefloris, axillaribus": it is the subsequent ones from the newer leaf-axils that are racemose and many-flowered and give to the twigs the appearance of ending in loose leafy panicles. I therefore identify *H. cochinchinense* with *C. Wightii*, and say that Loureiro drew up his description from plants that were just beginning to flower.

The first botanist to suggest that *H. cochinchinense* might be *C. formosum* (Jack) Dyer was Pierre but he noted the discrepancies and confessed himself dissatisfied (Fl. For. Cochinch. pl. 51). This suggestion was copied by Gagnepain as if it were a certainty (Fl. Gen. Indoch. I, p. 288) and it is evidently the basis of Merrill's mistake. *C. formosum* has pale pink or white petals, simply conic, straight, rather small nectaries, comparatively long petioles and oblong not ovate capsules: it flowers from its bare twigs. If *H. cochinchinense* can be turned into *C. formosum*, there will no more object in describing plants in detail: for all *Cratoxylons* could then be turned into one species.

The pressed flowers of *C. Wightii* stain the paper bright yellow to golden orange. Those of *C. formosum* give only a faint orange smear from the crushed nectaries.

Elodea sumatrana Jack, Mal. Misc. II, 1822, No. 7, p. 22.

= *Cratoxylon sumatranum* (Jack) Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 16.

The important points in Jack's description are:—

"Foliis subsessilibus, oblongis attenuato-acuminatis..... paniculis terminalibus foliosis.....petalis basi nudis."

"A large shrub or small tree.....Leaves almost sessilebroad at the base.....6 or 7" length..... the surface appears by the aid of the microscope to be dotted with opaque points."

"Panicle terminal, foliose, the lower divisions being axillary....."

Flowers dark red or purple.....

Nectaries 3 yellow.....half as large as the petals..... doubled backwards upon themselves in such a manner as to form a sac which opens behind near the base.....

Capsule oblong.....

The leaves are destitute of pellucid dots, and have their lateral nerves strongly and distinctly marked....."

The description indicates the group of *C. polyanthum* but I am unable to decide to which species it should belong because the description seems to fit both *C. racemosum* Bl. and *C. neriofolium* Kurz, with neither of which I have any first-hand acquaintance. At first I thought *E. sumatrana* was *C. polyanthum* itself but that cannot be because *C. polyanthum* is a rather big tree with a tapered-cuneate leaf-base, a smaller leaf-blade (apparently not exceeding 4" long and generally 2-3"), lateral veins which I consider rather faintly marked in the fresh leaves and pink flowers. Unfortunately Jack omitted the size of the flower, which might have been distinctive. Blume referred to *E. sumatrana* the specimens which Korthals misidentified with *C. Hornschuchii* Bl. and under Korthals' description I find the leaf-base described as "obtuse sæpe biauriculata" as in *C. neriofolium*. Too little is known about the flora of Sumatra to say that *C. neriofolium* does not occur there. Jack himself

thought that *E. sumatrana* might have been *H. cochinchinense* Lour. but Loureiro described the leaf-apex of his species as 'obtusa' and the capsule as 'ovata': moreover *C. Wightii*, which I identify with *H. cochinchinense*, has a cuneate leaf-base as *C. polyanthum*.

I doubt if the identity of Jack's species can be established without resort to the study of *Cratoxylon* in the type-locality (Tello Dalam, in the island of Pulo Niras). *C. racemosum* Bl. is, at present, its most likely synonym. Are *C. racemosum* and *C. neriifolium* specifically distinct?

Elodea formosa Jack, Mal. Misc. II, 1822, No. 7, p. 24.

= *Cratoxylon formosum* (Jack) Dyer, F.B. I., 1, 1874, p. 258.

The important points in the description are:—

"Foliis petiolatis, lanceolatis subtus glaucis pedunculis fasciculatis axillaribus.....nectariis acutis.

A small tree with cinereous bark.

Leaves.....acute, glaucous beneath, pellucidly punctate, two and a half inches long.....Petioles slender.

Peduncules.....from the axils of fallen leaves, fasciculate, 1-flowered.

Flowers white, with a slight rosy tinge.....

Petals.....with a broad adnate scale a little above the base.....

Nectaries.....red, acute, carinate behind.....

Capsule oblong.....

Native of Sumatra."

A species of the group containing *C. formosum* auctt., *C. Maingayi* and *C. pruniflorum* is indicated. The absence of any mention of hairs rules out *C. pruniflorum*. I am, however, unable to decide between the others. Concerning *C. Maingayi* we know very little and that little reveals no other distinction from *C. formosum* auctt. than a rather narrow, more pointed, and shorter-stalked leaf and, *teste* Ridley, white petals for *C. Maingayi*. From the figure given by King (Ann. Roy. Bot. Gard. Calc. V. pt. 2, 1896, t. 165), *C. Maingayi* seems also to have fewer anthers in a staminal bundle than *C. formosum* auctt., but one cannot say how accurate is this feature of the plate. In all three species, *C. pruniflorum*, *C. formosum* and *C. Maingayi*, the leaves tend to be glaucous beneath. On the face of it, one would identify *E. formosa* Jack with *C. Maingayi* Dyer. This would mean that *C. formosa* auctt., which is undoubtedly *Tridesmis formosa* Korth., would have to be given a new specific epithet, presumably that from *Tridesmis ochnoides* Spach to which Blume reduced Korthals' species.

I think, myself, however that *C. Maingayi* is only a white-flowered variety of *C. formosum* auctt. which is a variable species. In Singapore *C. formosum* auctt. has two varieties, the one being smaller by a half to two-thirds in

linear measure than the other. The small variety has a more narrowly fissured bark with smaller scales, rather small and almost lanceolate, acute leaves $\frac{3}{4}$ – $1\frac{3}{4}$ " wide, smaller flowers .5–.6" wide, and narrower capsules .15" wide: it is moreover a smaller tree, reaching only 50–60 ft. high. The larger variety has rather coarsely fissured and scaly bark as in *C. arborescens*, rather broadly elliptic and bluntly subacuminate leaves $1\frac{1}{2}$ –3" wide, flowers .7–.9" wide and capsules .25–.3" wide: it reaches 120 ft. high. The small variety is deciduous by branches: the large is wholly deciduous at once. Moreover, independently of these distinctions, the leaves of some trees are distinctly glaucous beneath, and others are not at all. The study of such variation must be made on living trees. Gagnepain gives the flowers of *C. formosum* auctt. as "blanches, rosées" (Fl. Gen. Indoch. I, p. 289), and he describes a var. *Thorelii* which has the distinctions of *C. Maingayi*. I cannot decide whether two recent collections from Sumatra, Bartlett 7687 and 7907, should be *C. formosum* auctt. or *C. Maingayi*, or *C. formosum* var. *Thorelii*. I am not certain even that *C. pruniflorum* is specifically distinct.

I think that the exact identification of *E. formosa* Jack cannot be decided until the living plants of Sumatra have been better studied. It is certain however, as I have shown above, that *C. formosum* (Jack) Dyer is not a synonym of *C. cochinchinense*.

Under the circumstances it is preferable to follow at present Dyer, King, Pierre, Gagnepain, Koorders, Ridley, etc. who give the name *C. formosum* to the common, glabrous *Cratoxylon* with clusters of pink flowers on its bare twigs and to keep *C. Maingayi* for a state with white flowers.

It must be noted that *E. formosa* Jack (1822) and *Tridesmis formosa* Korth. (1839) were independent binomials, though both reduced to *T. ochroides* Spach by Blume and to *C. formosum* (Jack) Dyer by Dyer. Korthals' species is what has always been meant by *C. formosum*, since the publication of the Flora of British India.

Cratoxylon ligustrinum (Spach) Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 16.

= *C. polyanthum* Korth. Verh. Nat. Gesch. Nederl. Overz. Bez. Bot. 1839, p. 175, t. 36. (fide Dyer, F.B.I. I, 1875, p. 257).

The identification of *Ancistrolobus ligustrinus* Spach with *C. polyanthum* appears to have been made by Dyer. There has been no botanical proof, so far as I can ascertain, but I suppose one must believe it as other botanists have done.

Dyer also reduced *C. Wightii* Bl. to *C. polyanthum* as var. *Wightii* and this identification has also been taken on trust. I find, however, that the plants which grow in the north of Malaya and which have been identified correctly, without doubt, with var. *Wightii* from Burma, Siam, and Indochina cannot be considered the same species as *C. polyanthum*. The chief difference between them lies in the bark which in *C. polyanthum* is like that of a plane tree (*Platanus occidentalis*), though as smooth as that of a Eucalyptus or Tristania when the bark has peeled, and in *C. Wightii* is rugged and scaly. The species also differ in habit, *C. Wightii* being a shrub or small tree and *C. polyanthum* commonly a big tree, in the development of the inflorescence, in the flower-size and in the leaf-shape. They are certainly closely allied but I have never seen or read of another species of tree that might vary into two so different bark-characters. I find the bark-characters of trees in Malaya remarkably constant. Some kinds of tree, admittedly, may change their bark as they grow, as the scaly or shaggy bark of young Eucalyptus and Tristania gives way to the smooth trunks, and that of *Cratoxylon arborescens* also changes rather strikingly. But I have purposely examined this possibility by studying saplings of *C. Wightii* in Kedah and Kelantan, and of *C. polyanthum* in Penang, Pahang, Johore and Singapore. *C. polyanthum* always has smooth bark from the sapling state. Kurz and Pierre also describe the characteristic bark of *C. polyanthum*. Presumably *C. ligustrinum* had smooth bark.

If botanists prefer to unite *C. Wightii* and *C. polyanthum*, then the correct name for *C. polyanthum* will be *C. cochinchinense* var. *ligustrinum* (Dyer), because *C. polyanthum* var. *Wightii* Dyer is identical with *C. cochinchinense*.

As synonyms of *C. ligustrinum*, Merrill has given *Hypericum olympicum* (non Linn.) Lour. and *H. petiolatum* (non Linn.) Lour., and I wish to draw attention to these in order to show with what caution unproven identifications should be admitted into systematic botany. In the first place there are no such species as *H. olympicum* Lour. and *H. petiolatum* Lour. Loureiro opened each description with the diagnosis of, and citation to, the Linnean species as described in Sp. Plant. Ed. 2. That he was uncertain of his identification of the Cochinchinese plants with *H. olympicum* L., Loureiro showed by a query, and that he considered the plant called "Le nganh tlang" might be typical and the plant called "Hoang xoc" might be a variety, he showed by the greek letters for a and b, as was the custom, and the first vernacular name he also queried. The

Cochinchinese plant which he identified with *H. petiolatum* L., Loureiro considered to be a variety of the Linnean species by 1. writing the greek letter for b only after the specific name, 2. omitting the words "subtus tomentosus" for the leaves from the Linnean diagnosis and 3. writing "vix tomentosa" for the leaves in his own description. In other words these Cochinchinese plants were not described under any new names, specific or varietal, by Loureiro.

As for the identification of the Cochinchinese plants, in the second case, Loureiro wrote in his own description under *H. olympicum* "Flos luteus, pedunculis incanis" and under *H. petiolatum* "Caulis fruticosus, multiplex, 3-pedalis, angulatus, diffusus. . . . Flos flavo-ruber". If it is possible to identify both these Cochinchinese plants as *C. ligustrinum* from Loureiro's description alone, then surely botanists are entitled to an explanation of how the description of a pink-flowered timber-tree can be made to fit that of a yellow-flowered, 3-foot shrub. Unless his descriptions are utterly fallacious, it seems to me that Loureiro's plants must have been species of *Hypericum*.

Cratoxylon arborescens (Vahl) Bl., Mus. Bot. Lugd. 2. 1852, p. 17.

= *Hypericum arborescens* Vahl., Symb. II, p. 86, t. 43 fide Blume.

If the Malayan specimens have been correctly identified as *C. arborescens* then this species has never been properly described. It was believed to have no basal scale to the petal until King discovered that it had a "laciniate scale". (Mat. Fl. Mal. Pen. I, 1890, p. 86). The nectary has not, however, been described specifically, though Dyer placed the species in the section with more or less cucullate nectaries. I have examined all the specimens in the Singapore Herbarium and found that, out of 78, 16 have the large cucullate nectaries typical of *C. ligustrinum* and the rest have a simple nectary like a very small oblong knob, as may occur also in *C. ligustrinum*: in some cases, it is so rudimentary that it is merely a point between the staminal bundles. But these specimens could not be distinguished by any other constant feature, hence it is evident that the nectary varies between the states of the section *Ancistrolobus* and that of the section *Tridesmis*. This variation also occurs in the specimens which Ridley has referred to *C. microphyllum* Miq. The colour of the nectary I do not know. As for the scale on the petal, I found it was conspicuous and deeply laciniate in most specimens but in a few it was small and denticulate and even vestigial like the nectary.

C. arborescens is, perhaps, the commonest species of the genus in the high forest in Malaya.

The variety *Miquelii* in its typical state is well-characterised by its thin, narrow and pointed leaf with slender petiole, but I believe that there are intermediates. Ridley considered that var. *Miquelii* had smaller flowers than the typical *C. arborescens* but I have recently been able to examine the flowers of several trees of the var. *Miquelii* on Fraser's Hill, in Pahang, and I could find no difference whatever: in both type and variety they vary from .3–.4" wide across the petals: in structure, both flower and fruit are identical, var. *Miquelii* also having both kinds of nectary and occasionally none at all. Nor is there any difference in the size of the trees as Mr. C. F. Symington has informed me and as I have learnt also from a study of the trees on Penang Hill and Fraser's Hill: those of var. *Miquelii* will reach 100 ft. though they may begin to flower at 12 ft. The Malayan collections indicate that *C. arborescens* (typical) is a lowland and, predominantly, swamp-loving tree and that var. *Miquelii* occurs on the hillsides and mountains from low levels to an altitude of 4,000 ft. A comparison of living specimens at intermediate levels is much to be desired, in the high-level swamps of foot-hills for instance.

Cratoxylon microphyllum Miq., Fl. Ind. Bat. Suppl. I, 1860, p. 500. Ridley F.M.P. I, 1922, p. 153.

The Malayan specimens referred by Ridley to Miquel's species are Derry 636 (Mt. Ophir, 1890, 3,000 ft.) and Ridley s.n. (Mt. Ophir, June, 1892). In the Singapore Herbarium there are also the following sheets of the same species as the Malayan:—

Haviland s.n. Sarawak.

Haviland 72, Braang, Borneo Nov. 1888 (2 sheets).

Hullett 5697 Gunong Dai, Lingga, Borneo, July 1893.

Horsfield s.n.ex Herb. Mus. Brit. (2 sheets).

Native Collector 370 Sarawak, det. *C. glaucum* Korth.

Native Collector 639 Sarawak, det. *C. glaucum* Korth.

I am doubtful if this species, which for convenience I will call *Cratoxylon A*, is either *C. microphyllum* or *C. glaucum*. Korthals described *C. glaucum* with glabrous leaves, cucullate nectaries and without a basal scale to the petal. Apparently the same applies to *C. microphyllum* which Miquel also placed in *Cratoxylon* (no petal-scale) in contrast with *Tridesmis* (with a petal-scale). *Cratoxylon A* has a distinct, small denticulate petal-scale: the underside of the leaves appears minutely felted in the areolæ as though there were stomatal pits covered with decumbent, moniliform hairs of inflated oval or globose cells. *Cratoxylon A* is certainly very close to *C. arborescens*, differing in its

smaller leaves with this peculiar epidermal structure on the undersurface, its distinctly larger flowers and its smaller and merely denticulate petal-scale. Its seed is winged all round as in *C. arborescens*: it shows the same variation in the form of the nectary: and I have little doubt that it is evergreen.

The Subdivision of *Cratoxylon*

Cratoxylon was monographed first and last by Blume (Mus. Bot. Lugd. Bat. II, 1852, 15). Several species have been added since without the old ones having been re-described or, in some cases, even recognised. Consequently, botanists do not know 'where they are' when they wish to study the species of their country. A revision is much wanted. I put down some notes for the arrangement of the triadelphous members of the genus.

Section 1 (a new section is needed)

Evergreen: sapling without spines on the trunk: flowers in terminal, erect panicles: *petals* blood red with a lacinate or denticulate scale at the extreme base: *nectary* greenish yellow cucullate or small and knob-like in the same species: *capsule* covered for $\frac{1}{2}$ – $\frac{2}{3}$ its length by the sepals, the petals generally caducous: *seeds* oblong, winged all round.

C. arborescens, *Cratoxylon* A (p. 32).

Section 2. (*Ancistrolobus* Spach)

Deciduous: sapling with spines on the trunk (*C. cochinchinense*, *C. ligustrinum*): flowering at the ends of the new shoots: *panicles* erect or drooping, distinct or leafy at the base, or with short racemes from the leaf-axils to form a leafy panicle, or with axillary few-flowered cymes: *petals* deep red or pink, without a basal scale: *nectary* yellow, large cucullate: *capsule* covered for $\frac{2}{3}$ – $\frac{3}{4}$ its length by the sepals, the petals generally persistent (c.f. the length of capsule and sepal): seeds with a unilateral wing.

C. cochinchinense, *C. ligustrinum*, *C. neriifolium*, *C. racemosum*, *C. sumatranum*.

Section 3 (*Tridesmis* Spach, pro parte 'triadelphia')

As Section 2 but:—flowering from the axils of the fallen leaves, on the last season's twigs before or with the new leaves: *inflorescences* as short few-flowered cymes, or clusters: *petals* white or pale pink, with a basal scale entire or denticulate, and adnate to the petal for a short distance: *nectary* red or orange-red (? in all), conic or knob-like, rather small: *capsule* covered for $\frac{1}{3}$ or $\frac{1}{4}$ of its length by the sepals, the petals caducous.

C. formosum, *C. Maingayi*, *C. pruniflorum*.

Synonymy

Cratoxylon arborescens (Vahl) Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 17.

Hypericum arborescens Vahl, Symb. II, 1791, p. 86, t. 43 (fide Blume).

Ancistrolobus glaucescens Turcz., Bull. Mosc. I, 1858, p. 383 (fide Dyer).

C. arborescens var. **Miquelii** King, Fl. Mal. Pen. I, 1890, p. 86.

C. cuneatum Miq., Fl. Ind. Bat. I, pt. II, 1859, p. 517 (fide King).

Cratoxylon cochinchinense (Lour.) Bl., Mus. Bot. Lugd. Bat. II, 1852, 17.

Hypericum cochinchinense Lour., Fl. Cochinch., 1790, p. 472.

Cratoxylon Wightii Bl., loc. cit. p. 18.

Ancistrolobus sp. Wight, Illustr. I, 1840, p. 111.

Cratoxylon polyanthum var. *Wightii* Dyer, F.B.I. I, 1874, p. 257.

non *C. cochinchinense* sensu Merrill [Tr. Am. Phil. Soc. 24, pt. II, 1935, p. 268 = *C. formosum* (Jack) Dyer].

Cratoxylon formosum (Jack) Dyer, F.B.I. I, 1874, p. 258. *Elodea formosa* Jack, Mal. Misc. II, 1822, No. 7, p. 24 (sensu Dyer).

Tridesmis formosa Korth., (non *E. formosum* Jack), Verh. Nat. Gesch. Bot. 1839, p. 179, tab. 37.

Tridesmis ochnoides Spach, Hist. Veg. Phan. V, 1836, p. 359 (fide Blume).

Tr. Billiardieri Spach, Nouv. Ann. Sci. Nat. V, 1836, 352, t. 6 (fide Blume).

Tr. Jackii Spach, loc. cit. (fide Blume).

Hypericum aegyptium Blanco, Fl. Filip., 1837, p. 615 (fide Blume et Merrill).

Cratoxylon cochinchinense (Lour) Bl., sensu Gagnepain (Fl. Gen. Indoch. I, p. 288) et Merrill (Tr. Am. Phil. Soc. 24, pt. II, 1935, p. 268).

Cratoxylon formosum auctt., sed ? *E. formosum* Jack (? = *C. Maingayi* Dyer).

Cratoxylon ligustrinum (Spach) Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 16.

Ancistrolobus ligustrinus Spach, Nouv. Ann. Sci. Nat. V, 1836 p. 352 t. 63.

Hypericum chinense Retz., Observ. V, 1789, p. 27 (fide Blume) (non *H. chinense* Linn.)

Hypericum biflorum Lam., Encycl. IV, 1796, p. 170 (non *Cratoxylon biflorum* Turcz.).

Cratoxylon polyanthum Korth., Verh. Nat. Gesch. Bot., 1839, p. 175, t. 36 (fide Dyer).

Ancistrolobus brevipes Turcz., Bull. Mosc. I, 1858, p. 383 (fide Dyer).

Cratoxylon laceolatum Miq., Fl. Ind. Bat. Suppl. I, 1860, p. 500 (fide Dyer).

Cratoxylon biflorum Turcz., Bull. Mosc. 36, 1863, p. 580 (fide Merrill) (non *H. biflorum* Lam.).

Cratoxylon polyanthum var. *ligustrinum* Dyer, F.B.I. I, 1874, p. 257.

Cratoxylon chinense (Retz.) Merrill, Philipp. Journ. Sci. Bot. 4, 1909, p. 292.

Cratoxylon Maingayi Dyer, F.B.I. I, 1874, p. 258.

? *Elodea formosa* Jack, Mal. Misc. II, 1822, No. 7, p. 24: [*Cratoxylon formosum* (Jack) Dyer, F.B.I. I, 1874, p. 258].

Cratoxylon sumatranum (Jack) Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 16.

Elodea sumatrana Jack, Mal. Misc. II, 1822, No. 7, p. 16.

? = *Cratoxylon racemosum* Bl., Mus. Bot. Lugd. Bat. II, 1852, p. 16.

Conclusions on *Cratoxylon*

C. cochinchinense (Lour.) Bl. is identified with *C. Wightii* Bl. (= *C. polyanthum* var. *Wightii*). It is considered a distinct species from *C. ligustrinum* (Spach) Bl. (= *C. polyanthum* Korth.). Merrill's identification of *C. cochinchinense* with *C. formosum* auctt. is shown to be untenable. *C. Wightii* is therefore reduced to *C. cochinchinense*.

C. sumatranum (Jack) Bl. may be *C. racemosum* Bl. or *C. neriifolium* Kurz. but it is considered unidentifiable at present, though most probably the former.

C. formosum (Jack) Dyer appears to be identical with *C. Maingayi* Dyer but until the flora of Sumatra is better known it is advisable to follow the usual interpretation of the species on *Tridesmis formosa* Korth. as given by Dyer, King, Koorders, Gagnepain, etc. and to regard *C. Maingayi* as, perhaps, a white-flowered form.

C. ligustrinum (Spach) Bl. appears to be the correct name for *C. polyanthum* Korth. The differences from *C. cochinchinense* (= *C. Wightii*) are given.

There are no such species as *Hypericum olympicum* Lour. and *H. petiolatum* Lour. The plants referred by

Loureiro to *H. olympicum* Linn. and *H. petiolatum* Linn. are not *C. ligustrinum* but, probably, species of *Hypericum*.

The occurrence of *C. microphyllum* Miq. in Malaya is doubtful.

An arrangement of the triadelphous species is suggested, but the whole genus is in need of revision.

GUTTIFERÆ

Garcinia

G. Cowa, *G. nigrolineata*, *G. parvifolia*, *G. globulosa*

These species have been so confused in the Malayan flora that their differences have not yet been clearly stated. Ridley attempted to straighten the confusion in 1910 by defining *G. nigrolineata* afresh, and distinguishing *G. globulosa* as a new species from *G. parvifolia* (Journ. Str. Br. Roy. As. Soc. 54, 1910, p. 18). I find that Ridley's idea of *G. nigrolineata* covers also *G. Cowa* and that *G. globulosa* is not distinguishable from *G. parvifolia*.

I make the diagnostic features of the three to be these:—

Male flowers 10–13 mm. wide with short thick pedicels 4–8 mm. long: *petals* 7–10 × 5–6 mm. broad, *yellow flushed pink or red*: *stigma* 4–6 mm. wide: *fruit longitudinally grooved* *G. Cowa*
Male flowers with rather slender pedicels: *petals clear pale yellow*: *fruit not grooved*

Male flowers 10–13 mm. wide with pedicels 9–14 mm. long: *petals* 6–8 × 2–3 mm., *ligulate, reflexed in the middle*, persistent on the fruit: *calyx of female flowers* 10–13 mm. wide: *fruit umbonate, faintly ribbed, the umbo tipped with the stigma* 2.5–3.5 mm. wide: *seeds large with little pulp*, (in t.s. of fruit, seeds 8–14 mm. wide, pulp 2 mm. wide) *G. nigrolineata*
Male flowers 7–10 mm. wide with pedicels 4–10 mm. long: *petals* 4–6 × 2.5–4 mm., *not reflexed*, *caducous*: *calyx of female flowers* 4–6 mm. wide: *fruit round or oblong, occasionally umbonate, the stigma and calyx generally deeply sunken*, the *stigma* 1.5 mm. wide: *seeds small with much pulp* (in t.s. of fruit, the seeds 3–5 mm. thick, the pulp 3–5 mm. thick) *G. parvifolia*

It is often very difficult to distinguish the species by leaf. *G. parvifolia* has elliptic, acuminate or caudate leaves; *G. Cowa* has lanceolate elliptic, simply acute leaves; *G. nigrolineata* has ovate-lanceolate, acuminate leaves often larger and generally drying brown with fine, short black lines.

G. Cowa Roxb., Fl. Ind. 2, 1832, p. 622.

As understood by King (Mat. Fl. Mal. Pen. 1, p. 104), *G. Cowa* differs from *G. Kydia* in its smaller male flowers

(.4" wide in *G. Cowa*, .75" in *G. Kydia*), in its groups of 3-8 female flowers (solitary in *G. Kydia*), its fruits being grooved from base to apex and its stigma not raised on an umbo (the fruit of *G. Kydia* grooved only near the apex and with the stigma on an umbo).

I have seen many trees of *G. Cowa* in the north of Malaya and have compared them with trees of *G. Kydia* in the Singapore Botanic Gardens. I find that the difference in size of the male flowers (the petals of *G. Kydia* being $10-14 \times 6-10$ mm.) and in grouping of the female flowers holds with the addition that the petals of *G. Kydia* are clear pale yellow while those of *G. Cowa* are flushed pink or red, but that the differences in the fruit do not hold. The fruit of *G. Cowa* in Malaya may be umbonate or not, with grooves proceeding from base to apex or at the apex only, and with the stigma sunken or not. On the other hand, the fruits of *G. Kydia* in Singapore ripen orange-red and are slightly ribbed, not grooved, while those of *G. Cowa* turn orange-ochre. The leaves of the two species seem identical.

I think it better to follow Hooker and make *G. Kydia* a variety of *G. Cowa*.

G. nigrolineata Anderson, F.B.I. 1, 1874, p. 263.

Ridley mistakenly attributed the species to Pierre who, according to King, partly misinterpreted Anderson's species. It is based on the Malaccan collections of Griffith and Maingay.

The critical points in Anderson's description are the rather large, ovate-lanceolate leaf drying ferruginous beneath, the long pedicels of the male flower ($1\frac{1}{4}-1\frac{1}{2}$ "), the reflexed petals, and the stipitate stigma of the fruit. From these, I identify the Malayan specimens.

As pointed out by Ridley, King confused the much commoner *G. parvifolia* with *G. nigrolineata*.

G. parvifolia (Miq.) Miq., Ann. Mus. Lugd. Bat. 1, p. 208.

Basinym: *Rhinostigma parvifolium* Miq., Fl. Ind. Bat. Suppl. 1862, p. 495.

Synonym: *G. globulosa* Ridley, Journ. Str. Br. R. As. Soc. 54, 1910, p. 20.

Not having seen Miquel's type, I follow King and Ridley in their interpretation of it. Ridley distinguished *G. globulosa* from *G. parvifolia* by its smaller leaves, smaller male flowers and smaller round fruit with sunken stigma and no umbo. The leaves are, however, much more variable in size than Ridley has given, being $2-6 \times \frac{3}{4}-2\frac{1}{4}$ ". I can detect no difference in the size of the male flowers and, though Ridley gave about 20 stamens for *G. globulosa* and 30 for *G. parvifolia*, I find that their number may vary from

15-30 on the same tree. As regards the fruit, the extreme states described by Ridley seem very distinct but they are connected by every intermediate and I have seen one tree which had both small round fruits, $\frac{1}{2}$ " wide, and oblong fruits, $1\frac{1}{4} \times \frac{3}{4}$ ", with the stigma concealed either in a pit or almost flush with the surface. Hence, I think that *G. globulosa* cannot even be distinguished as a variety. It may be remarked that the variation of tropical trees is commonly surprising and that it cannot be judged from preconceived ideas about plants.

RUTACEÆ

Zanthoxylum

Z. rhetsa D.C.

This Indo-Siamese species must be added to the Malayan flora. I have seen that it is not uncommon in the rice-fields and secondary jungle (belukar) in the neighbourhood of Kota Bahru in Kelantan. I was fortunate in finding two trees, about 60 ft. high, the one with male flowers and the other with female flowers and fruits, so that the identity of the species was without doubt. The tetramerous flower, unilocular, bi-ovulate ovary, and entire, very asymmetric, acuminate leaflets are characteristic. The species is clearly dioecious. Although I did not meet it in the high forest (most probably because I had no time to explore the forest), it was so evidently at home with *Dillenia aurea*, *Streblus*, *Cratoxylon*, *Eurya*, *Decaspermum*, *Buchanania*, and so on, in the belukar that there could be no doubt of it being a natural element of the flora.

To the local Malays it is well-known as "Hantu Duri" or "Hantar Duri". The hard black seeds are used by children in their pea-shooters.

SAPINDACEÆ

Allophylus

In the most recent revision of the genus by Radlkofer a very large number of species are described, about 180 in all, and seven species are ascribed to Malaya (Pflanzenr. 4, 1932, p. 165). Ridley made five species for Malaya, but King and Hiern considered that there was only one.

A perusal of Radlkofer's work shows that the species are grouped primarily according to geographical distribution, whether American, African or Asiatic, and that there is no attempt to relate the species of the three "regions." In the second place, not one structural floral difference is mentioned in the whole genus, so that the species are separated on vegetative characters or on slight differences

in the size of the flower. In the third place the key to the species is impracticable so far as the Malayan flora is concerned. I have therefore examined the material in the Singapore Herbarium as critically as possible.

I have dissected the flowers of every available specimen from species Asiatic, African and Australian. The structure of the flower, as well as that of the inflorescence and fruit, I find to be identical and only trivial variations in the size of the flower and the shape of the petals can be discovered. The 'specific' differences relate only to the leaves (shape, size, toothings), the twigs (colour) and the branching of the inflorescence. And, so far as the Malayan specimens are concerned, these differences are not constant but all are bridged by one or more collections. Hence I follow King, Hiern, Koorders and Valetton (Bijdr. Booms. 9, p. 148) and refer all our Malayan collections to the one species, *A. cobbe* (L) Bl. The differences between the Malayan "species" are such as one finds in any common and variable plant like *Taraxacum officinale*, *Hevea brasiliensis* or *Ixora javanica*, and are in no way comparable with the differences in structure of flower and fruit by which one normally distinguishes a species, e.g. in *Mangifera*, *Ficus*, *Cassia*. Indeed, I wonder if there are even 10 good species in the whole genus. I have, therefore, no hesitation in combatting the "splitting" into micro-species which is becoming more and more popular in the study of dried specimens of tropical plants.

Two characters which Radlkofer employs to distinguish groups of "species" are the colour of the twig and the branching of the inflorescence. But these are unreliable. *A. glaber* sensu Radlkofer has dark young twigs and pale old ones and it has simple and branched inflorescences on the same plant or on plants which differ in no other respect. Moreover, Radlkofer overlooks differences in the size of leaflet, petiole and petiolule, the number of veins and the presence or absence of hair-tufts in the axils of the lateral veins on the underside of the leaf, which points lend further variety. Thus Ridley 7364, placed by Radlkofer in *A. racemosus*, is different from Kunster 10238 also placed by Radlkofer in *A. racemosus*: they differ in general hairiness as well as in leaf-size and the presence of axillary hair-tufts. There are several differences also in the colour of the fresh leaves and the ripe fruits which one may consider equally "specific" with those of the dried leaves and dried twigs. Yet one would not make species on such variations.

Hiern distinguished several varieties of *A. cobbe* in the Flora of British India. I am unable to follow his treatment, the varieties not being typified, and so I have proposed five new varieties for the Malayan flora.

The remarkable, evolutionary state of *Allophylus* cannot pass unheeded, nevertheless. There is great variety in leaf-size, toothing, hairiness and branching of the inflorescence and yet such conspecific uniformity in flower and fruit. I do not know a like condition in another genus.

A. cobbe (L) Bl.

Key to the Varieties

- | | |
|---|-----------------------|
| Twigs, petioles and undersides of leaf-blades closely hispid-velvety, the hairs 1-2 mm. long, the lamina often glabrescent: inland | var. <i>villosus</i> |
| Twigs and petioles glabrescent or only finely velvety, the hairs less than .5 mm. long, the leaf-blade never velvety beneath: often coastal | |
| Leaflets without axillary hairtufts to the nerves | var. <i>glaber</i> |
| Leaflets with axillary hairtufts to the nerves | |
| Twigs, petioles and both sides of the midrib persistently finely velvety: rocky and sandy coasts | var. <i>velutinus</i> |
| Twigs, petioles and midribs glabrous or glabrescent | |
| Leaflets broadly elliptic or ovate, 4-10 cm. wide: rocky and sandy shores of the East coast | var. <i>marinus</i> |
| Leaflets lanceolate, 2-6.5 cm. wide: mangrove | var. <i>limosus</i> |

var. *glaber* var. nov.

Novellis sparse pubescentibus, mox glabrescentibus; foliolis 8-28 × 2.5-10.5 cm., ovato-ellipticis, subcoriaceis, integris vel subdentatis, costis lateralibus utrinsecus 8-12, axillis costarum pilis deficientibus: petiolis 2.5-14 cm. longis: thyrsis 10-25 cm. longis, simplicibus vel 1-3 ramis præditis, subhirsutis vel glabris: ramulis primo fuscis dein pallidis.

Type.—For. Dept. 28173, leg. Jaamat, Sungei Lemoi, Pahang, 14.9.31.

Collections:—

KEDAH: Haniff & Nur 7157.

PENANG: Cantley 14, Curtis 771, 1465 (? 1466), 2288, 2776, Kunstler 1583.

PERAK: Burkill and Haniff 12993, Kunstler 4293, 8206, Scortechini 290.

PAHANG: For. Dept. 28173, Henderson 10545, 18387, Ridley s.n. 21.8.89.

SELANGOR: Curtis 2330, For. Dept. 524, 3031, 22745, 23081, Goodenough Oct. 1899.

NEGRI SEMBILAN: Alvins 833, Burkill 3544.

JOHORE: Burkill s.n. June 1915 (Pulau Tinggi).

This is like a glabrous form of var. *villosus* but with rather coriaceous leaves. It is also an inland, forest variety with large, many veined leaflets.

✓ var. **limosus** var. nov.

Novellis mox glabrescentibus, ramulis fuscis: foliolis 5-14 × 2-6.5 cm. subcarnosis, lanceolato-ellipticis, integris vel vix dentatis, costis lateralibus utrinsecus 7-10, axillis costarum pilis praeditis: petiolis 2.5-5 cm. longis: thyraxis 8-16 cm. longis, simplicibus, puberulis.

Type:—Corner 31602, Butterworth, Province Wellesley, 23.7.36.

Collections:—

LOWER SIAM: Haniff and Nur 4217.

LANGKAWI ILS.: Curtis 2869.

PENANG: Curtis 340, 2514.

PROVINCE WELLESLEY: Corner 31602 (type).

PERAK: Fox s.n. Sept. 1904 (Dindings).

SELANGOR: Burkill 352, For. Dept. 4714, 9816.

MALACCA: Alvins s.n. (Merlimau, 21.4.86).

JOHORE: Corner 29773, Ridley s.n. 1905 (Scudai River), Spare F810, F930.

SINGAPORE: Baker s.n. 15.10.17, Cantley s.n., Goodenough 2067, s.n. 5.8.89, Hullett 490, Ridley 273, 1607, 1919, 1919b, s.n. 1893.

This variety occurs only in mangrove-vegetation and on brackish tidal mud. Except that it is soon glabrous in all vegetative parts, it is like var. *velutinus*.

✓ var. **marinus** var. nov.

Novellis mox glabrescentibus, ramulis pallide-albidis: foliolis 6.5-20.5 × 4-10 cm., late ellipticis vel ovatis, integris vel subcrenato-dentatis, costis lateralibus utrinsecus 6-9, axillis costarum pilis praeditis: petiolis 4-8 cm. longis: thyraxis ramis 1-3 praeditis, ± glabris.

Type:—Corner 31495, Pulau Babi Tengah pr. Mersing, Johore, 27.9.36.

Collections:—

PAHANG: Burkill 1031 (P. Tioman), Corner s.n. 17.8.35 (P. Tioman), 29789 (P. Tioman), 29793 (P. Tioman), 29847 (P. Sepoi), 29849 (P. Sepoi), Nur 18905 (P. Tioman).

JOHORE: Burkill 895 (P. Tinggi), Corner 31495 *type* (P. Babi Tengah), s.n. 20.6.34 (Jason Bay).

This variety occurs only on the rocky and sandy shores of the East coast of Malaya, where it is rather common. The large ovate, glabrous leaflets and whitish twigs are characteristic.

✓ var. **velutinus** var. nov.

Ramulis, petiolis costisque velutinosi (pilis vix .5 mm. longis): foliolis 5-13 × 2-6 cm., parvis, lanceolato-ellipticis, membranaceis, integris vel serrato-dentatis, laminis vix puberulis, costis lateralibus utrinsecus 9-13, axillis costarum pilis praeditis: petiolis 2.5-6.5. longis: thyraxis simplicibus vel ramis 1-2 praeditis.

Type.—Corner 28470, S. Rhu Reba, Jason Bay, Johore, 11.6.34.

Collections:—

PENANG: 3111 (? Curtis).

PERAK: Kunstler 10238, Ridley 3009, Scortechini s.n. Aug. 1884 (Selama), Wray 2021, 3159.

PAHANG: Burn-Murdoch 301, Corner 29863, Ridley 2436, s.n. 20.8.89, s.n. Aug. 1891.

JOHORE: Corner 28470 (type).

This appears to be a coastal variety, though it may also occur inland. It often grows with var. *marinus* on the East coast of Malaya.

var. *villosus* var. nov.

Ramulis, petiolis foliolisque (subtus) *hispidis* (pilis 1–2 mm. longis) haud vel paullo glabrescentibus: foliolis 10–30 × 4–13 cm., ellipticis, membranaceis, dentatis, supra hispidis vel utrinque glabrescentibus, costis lateralibus utrinsecus 10–14, *axillis costarum pilis deficientibus*: petiolis 5–16.5 cm. longis: thyraxis simplicibus vel ramis 1–2 præditis.

Type.—Henderson 21885, Tembeling, Pahang, 14.7.29.

Collections:—

KEDAH: Corner s.n. 10.7.36 (Alor Star).

PENANG: Curtis 2279.

PERAK: Burn Murdoch 190, Curtis 1287, Ridley 9463, 10299, s.n. 1898, Scortechini s.n., Wray 3952.

PAHANG: Henderson 21885, Kiah 23968.

SELANGOR: Ridley 7364.

NEGRI SEMBILAN: Nur 11578.

MALACCA: Alvins 805, 724 (? 924), 1986, Hullett 842.

JOHORE: Ridley s.n. Dec. 1904 (Gunong Pulau).

This is an inland, forest variety distinguished by its large, thin, many-veined toothed leaves and more or less hispid-velvety parts. However, the leaf is more or less glabrescent in some collections and transitions to var. *glaber* appear common.

Collections between var. glaber and var. villosus

PAHANG: Kiah 23924, Nur 11106, Ridley 13501 (? 13581), Seimund 908.

MALACCA: Curtis s.n. April 1901 (Bukit Burong).

The rather long hair on the twigs and young parts, but the glabrescent lamina make it impossible to decide whether these collections should be var. *glaber* or var. *villosus*, both of which lack hair-tufts in the nerve-axils.

Collections between var. glaber and var. limosus

(a) Inflorescence simple

PENANG: Burkill 6583.

SELANGOR: Burkill 4410, Ridley s.n. Dec. 1896 (Gua Batu).

JOHORE: Ridley s.n. Nov. 1901.

(b) Inflorescence branched

PAHANG: Ridley s.n. Nov. 1900 (Telom).

JOHORE: Ridley 12214.

These collections have slight or distinct tufts of hair in the nerve-axils and thus connect var. *limosus* and var. *glabar*.

Collections between var. limosus and var. velutinus

PERAK: Haniff 15924.

PAHANG: Burkill s.n. June 1915 (P. Tioman).

JOHORE: Corner 31491 (P. Babi Tengah, pr. Mersing).

The twigs and petioles are persistently but finely puberulous in these collections, and Corner 31491 has the laxer venation of var. *limosus*.

Collections between var. limosus and var. marinus

Corner s.n. 29.9.35 (Pulau Merambong, Singapore).

This collection has the large leaflets of var. *marinus* but the dark twigs and more hairy inflorescence of var. *limosus*. The plant was growing on a sandy beach behind a small stand of mangrove. It is very like *A. scandens* except that it was a sprawling shrub.

A. scandens Ridley

Journ. Roy. As. Soc. 75, p. 26.

I consider this a very doubtful species. The herbarium specimen of Ridley's collection from Bukit Panjang in Singapore agrees exactly with Ridley's 12214 from Johore which I place between *A. cobbe* var. *limosus* and var. *glabar*. That there is really a climbing *Allophylus* in Malaya needs corroboration.

GUIOA

I have dissected the flowers of all the Malayan specimens in the Singapore herbarium and I find that, excepting a few sheets which for lack of material I can identify no further, these specimens fall into four species.

Radlkofer, in his monograph of the Sapindaceæ (Engler's Pflanzenreich IV, 165, 1933), gives eight species for Malaya, namely:—

- No. 10. *G. microphylla* Radlk.
- 11. *G. fuscidula* (Kurz) Radlk.
- 12. *G. squamosa* Radlk.
- 17. *G. diplopetala* (Hassk.) Radlk.
- 24. *G. pleuropteris* (Bl.) Radlk.
- 25. *G. bijuga* (Hiern) Radlk.
- 36. *G. pubescens* (Zoll. et Mor.) Radlk.

Of No. 10 there are no specimens at Singapore. Nos. 11, 12 and 17 I am unable to distinguish and have accordingly followed King in calling all our specimens *G. fuscidula*. I am convinced that, as with *Allophylus*, the genus has been over-specified.

Floral Differences

Disc entire, annular: petals considerably shorter than the sepals: petal-scales nearly twice as long as the petals: the two outer sepals considerably shorter than the others	<i>G. fuscidula</i>
Disc notched or open on one side, incomplete: petals as long as the sepals or longer: petal-scales shorter than the petals	<i>G. bijuga</i> , <i>G. pleuropteris</i> , <i>G. pubescens</i>

Key to the Malayan Species of Guioa

Glabrous or nearly so: leaflets 1-2 pairs: rachis winged: throughout Malaya, chiefly riverbanks	<i>G. bijuga</i>
Twigs, rachis and undersides of the leaflets more or less persistently silky hairy	
Leaflets 2-3 pairs, rather broad: rachis more or less winged: sandy beaches on the East coast and Singapore	<i>G. pleuropteris</i>
Leaflets 3-5 pairs, rather narrow: rachis not winged: inland	
Leaflets closely and finely silky beneath: Malacca, Johore and Singapore	<i>G. pubescens</i>
Leaflets sparsely hairy beneath: Perak, Penang and Kedah	<i>G. fuscidula</i>

G. bijuga

Buds silky: twigs, rachis and undersides of the leaves very soon glabrous, or very sparsely hairy.

Leaflets 1-2 pairs, $7.5-18 \times 2.5-7$ cm., elliptic, slightly acuminate, slightly curved, with 5-9 pairs of *lateral veins distinctly inarching short of the margin*: rachis narrowly to distinctly winged.

Inflorescence as in *G. pleuropteris* but laxer with fewer, longer, 4-6 mm. long, side-branches: outer sepals only slightly smaller than the others: petals as in *G. pleuropteris* but the scales nearly as long, or as long, as the petals and densely hairy (hairier than in *G. pleuropteris*): disc widely open on one side.

Fruit as in *G. pleuropteris*.

Throughout Malaya, chiefly on riverbanks (? in belukar or coastal), perhaps the commonest species.

G. fuscidula

Twigs, rachis and inflorescence brown silky hairy (dry), but the twigs and rachis glabrescent when old: the undersides of the leaflets persistently but rather sparsely hairy.

Leaflets 2-4 pairs, $4-13 \times 1.2-6.5$ cm., lanceolate-elliptic, curved, with 5-9 pairs of *lateral veins distinctly inarching short of the margin*: rachis not winged.

Inflorescence as in *G. pleuropteris*, but lax: flowers slightly smaller the two outer sepals much smaller than the

others: petals much shorter than the sepals, their scales nearly twice as long as themselves: disc entire.

Fruit ca. 1.7 cm. long, glabrous.

Inland secondary forest, Perak, Penang and Kedah.

Some collections have rather wider leaflets than others and some have the undersides of the leaflets glabrous.

G. pleuropteris

Twigs, rachis and inflorescences finely silky hairy, the undersides of the leaflets more or less glabrescent.

Leaflets 2-3 (rarely 4) pairs, 4-18 × 2-6.5 cm., rather large, lanceolate-obovate, blunt or subacute, with 4-9 pairs of *lateral veins passing obliquely out to the very edge of the leaf*, very faintly inarching at the edge or not at all: *rachis narrowly to rather broadly winged*.

Inflorescence 5-13 cm. long, simple or with 1-3 branches, the lateral branches of the thyrsi crowded and 2-4 mm. long: the two outer sepals distinctly smaller than the others: petals as long as the sepals and with the scales about a $\frac{1}{2}$ - $\frac{2}{3}$ of their length: disc very narrowly notched or practically entire (especially in the bisexual flowers).

Fruit 2 cm. long.

Sandy beaches and heaths of the East coast from Singapore to Kelantan, not known from the West coast or inland much from the sea.

G. pubescens

Hairy as *G. pleuropteris* but the undersides of the leaflets persistently finely and closely silky hairy.

Leaflets 3-5 pairs, 6.5-13 × 2-4 cm., lanceolate-elliptic, curved, strongly asymmetric, the basiscopic side of the base strongly cut away, with 6-9 pairs of *lateral veins distinctly inarching short of the margin*: rachis not winged: leaflet-stalks rather long.

Inflorescence as in *G. pleuropteris*; the two outer sepals distinctly, but not much, smaller than the others: petals and scales as in *G. bijuga*: disc open on one side but not so widely as in *G. bijuga* occasionally entire in the bisexual flowers.

Fruit silky then glabrescent.

Common in inland belukar of Malacca, Johore and Singapore.

AMPELIDACEÆ

Leea gigantea Griff.

Notulæ IV, p. 697.

Whether this species occurs in Malaya is doubtful. Excepting a few sheets which belong to other species, all those identified as *L. gigantea* in the Singapore herbarium

are referable to *L. indica* (Burm. f.) Merrill [= *L. sambucina* (L.) Willd.]. I am doubtful even if *L. gigantea* is specifically separable from *L. indica*.

RUBIACEÆ

Gardenia

G. tubifera Wall.

Roxb., Fl. Ind. ed. Wall. 2, 1824, p. 562.

Synonyms:—

G. resinifera Korth., Ned. Kruidk. Arch. 2, p. 191.

G. speciosa Hook. f., F.B.I. 3, 1880, p. 117=*Randia*

speciosa Hook. Ic. Pl. 1852, t. 824: haud *G. speciosa* Salisbury (1796).

G. elata Ridley, Journ. Roy. As. Soc. Str. Br. 79, 1918, p. 81.

G. Lobbii Craib, Fl. Siam. En. 2, 1932, p. 120.

I am unable to separate *G. tubifera*, *G. speciosa* and *G. elata* because there is so much variation in the plants that I cannot discover any natural dividing lines. Hooker distinguished *G. speciosa* from *G. tubifera* by its broader leaf, rounded at the tip and more abruptly narrowed at the base, its longer calyx and larger corolla. King followed Hooker but added that the calyx-tube of *G. tubifera* was sometimes split on one side, though truncate at the apex, while that of *G. speciosa* had an oblique mouth with a few irregular lobes. Ridley considered *G. tubifera* to be a bush, *G. speciosa*, *G. elata* and *G. resinifera* to be trees and separated them on differences in length of calyx and corolla and on whether the calyx was split or not: but the distinctions are very hard to follow.

I find that none of these characters are constant but are combined in various ways. In the first place, the leaves vary greatly in size, those on the flowering twigs being commonly much smaller than those on the vegetative shoots, with a tendency to anisophylly in the pairs, those on the upper or inner side of the twig being smaller. Hence, unless it is stated whether the measurements of the leaves cover those on flowering and sterile twigs, no characteristic can be attributed to them. In shape, petiole and venation the leaves of all three species are identical.

As regards the calyx-tube, the splitting on one side is variable. Entire and variously split tubes can be found on the same tree. This variation King has noticed in his three forms of *G. tubifera*, though I consider that his Form 2 is

worthy of varietal rank (*vide infra*, var. *subcarinata*). The variation was overlooked by Ridley.

As regards the size of the calyx and corolla, the following measurements show the gradation which renders any specific distinction on this ground impossible:—

	<i>Calyx-tube</i>	<i>Corolla-tube</i>	<i>Limb</i>	<i>Authority</i>
<i>G. tubifera</i>	1.3 cm. 4–4.5 cm.	4–7.5 cm.	2.5 cm.	Hooker
	for the fruit!			
	1–1.7 cm.	4.5–6.4 cm.	5–6.4 cm.	King
	1.3 cm.	7.7 cm.	5.5 cm.	Ridley
	1.2 cm.	4–7.5 cm.	2.5 cm.	Koorders and Valeton
	.6, .7, .8, .9, 1, 1.1, 1.2, 1.4, 1.5, 1.7 cm.	3, 4, 6, 7, 11 cm.	3, 4, 6, 6.5	Corner (ex. Herb. Sing.)

Special collections:—

Carr 26547, Mt. Kinabalu: calyx-tube 1.4–1.7 cm.: corolla-tube 3–3.5 cm.

For. Dept. B.N.B. 3861: calyx-tube 1 cm.: corolla-tube 11 cm.

Corner 32440, Johore: calyx-tube 1.7–2.3 cm.: corolla-tube 8.5–10.2 cm.

Kiah 32368 Johore: calyx-tube 1.5–1.8 cm.

	<i>Calyx-tube</i>	<i>Corolla-tube</i>	<i>Limb</i>	<i>Authority</i>
<i>G. speciosa</i> ..	3.8 cm.	7.6–9 cm.	10.2 cm.	Hooker
	2–3.8 cm.	7.6–9 cm.	6.3–7.6 cm.	King
<i>G. elata</i> ..	2 cm.	7.6 cm.		Ridley
	2, 2.3, 2.6 cm.	7.5, 11.5, 14.5 cm.	7, 8 cm.	Corner (ex. Herb. Sing.)

It will be seen that the collections Corner 32440 and Kiah 32368 unite the three species and that Carr 26547 and For. Dept. B.N.B. 3861 confound them. That Hooker misunderstood these *Gardenias* is evident from the different measure he gave for the flowering and fruiting calyx of *G. tubifera*: the calyx-tube does not enlarge in the fruit. Clearly *G. tubifera* is very variable in size of the corolla and calyx, just as *Ixora javanica*. Whether the difference in size has any varietal value can be decided only after an extensive study of the species in the field, but I am inclined to think that it will not be found of much significance.

As for the supposition that *G. tubifera* is a bush and the other species are trees, it seems to reduce to a statement that as *G. tubifera* grows up it becomes another species. These *Gardenias* begin to flower at an early age and gradually they develop into medium-sized trees 15–20 m. high. *G. tubifera* is commonly a bush by riversides but a little further removed into the forest one finds it a small tree 5–10 m. high. The collection Corner 32440 was from a tree 8 m. high, and Kiah 32368 from a tree 15 m. high. Hooker described *G. speciosa* originally as a shrub. I would

mention the cases of *Xylopia fusca* and *Sloetia elongata*, big trees reaching 50 m. high, which begin to flower as 1 m. saplings.

As regards *G. elata* I can see no difference between it and *G. speciosa* Hook., nor has Ridley or Craib (for his *G. Lobbiani*) indicated any contrast.

On the other hand I propose to distinguish King's Form 2 of *G. tubifera* as the following variety.

***G. tubifera* var. *subcarinata* var. nov.**

Calycis tubo breviori, 6–9 mm. longo, *subcarinato-striato costis* 6–9 *longitudinalibus*: corollæ tubo 4–7.5 cm. longo, limbo 4–5 cm. lato: ovario breviori 3–4 mm. longo.

Collections:—

KEDAH: For. Dept. 7501, Ridley s.n. June 1893.

PENANG: Curtis 686 (*type*).

PAHANG: Burkill and Haniff, 17129.

PERAK: Wray 2522.

SELANGOR: For. Dept. 4753.

MALACCA: Alvins s.n. 23.3.86.

SINGAPORE: Ridley 2588, 4416, Goodenough s.n. 25.1.90.

All these collections are from inland forest trees. They represent what Ridley called *G. resinifera* (Fl. Mal. Pen. 2, p. 82). The distinctive feature is the short, ribbed calyx-tube. The amount of resin on the twigs varies greatly in the whole species and cannot be estimated from herbarium specimens because it is more or less removed by alcohol.

It may be observed, in conclusion, that *G. coronaria* Ham differs from *G. tubifera* in its pedicellate ovary, oblong fruit and 5 petals. *G. Griffithii* differs from *G. tubifera* in its almost sessile leaves (the petiole being winged almost to the base), its much longer calyx-tube 5–7.5 cm. long which clothes the corolla-tube for more than half its length like a stocking, and the 8–12 petalled limb (6–10 in *G. tubifera*, mostly 8–9).

Pavetta

***P. indica* L. Sp. Pl. p. 110.**

Synonyms:—

Pavetta pauciflora Ridley, Fl. Mal. Pen. 2, 1923, p. 101.

Tarenna salicina Ridley, Journ. F.M.S. Mus. 4, 1911, p. 34.

I follow King, in the 'Materials', in regarding *P. graciliflora*, *P. tomentosa* and var. *canescens* as forms only of *P. indica*. I find it impossible to regard them even as satisfactory varieties, not because the extreme states are not decidedly different but because there is every intermediate condition from plants with glabrous leaves to those

with velvety leaves. In flower, fruit and inflorescence there is, also, no decided difference. If the extreme states are to be classified, what are we to do with the intermediates? It is these intermediates which are overlooked that seem to me most important. I think the species can be subdivided only after intensive ecological and horticultural study. It seems not to be realised, for instance, that *Terminalia*-branching is typical of *P. indica*, whereby laterals are projected beyond the 'range' of the parent shoot through the elongation of the first internode. Such laterals at the ends of the main branches generally bear the flowers so that the having of inflorescences projected laterally on "long peduncles" is not characteristic solely of *P. graciliflora*. I find, moreover, Craib's subdivision of *Pavetta* so intricate and impracticable that it seems impossible to identify any *Pavetta* unless one can compare it simultaneously with specimens he has determined. Koorders and Valeton also interpret *P. indica* in the widest sense (Bijdr. Booms. Java. 8).

As regards *P. pauciflora* and *T. salicina*, specimens of the type-collections are in the Singapore Herbarium. They are both what Ridley has also determined as *P. graciliflora*, that is the glabrous state of *P. indica* with 'long pedunculate' inflorescences. The tetramerous flower of the *Tarenna* Ridley himself described: there are also bacterial nodules on the leaves.

***P. naucleiflora* Don**

Gen. Syst. 3, 1834, p. 575.

Synonyms:—

Tarenna Napieri Ridley (= *Webera Napieri* Ridley), Journ. F.M.S. Mus. 4, 1911, p. 34.

Rutidea mollis Bl. vide Bremekamp, Blumea Suppl. 1, 1937, p. 112.

Specimens of the two syntypes of *T. Napieri* are in the Singapore Herbarium, namely Napier (Bukit Tangga, pr. Seremban) and Ridley (Telom). They are identical with *P. naucleiflora*, having the tetramerous flowers in small dense clusters, the hispid pedicels and calyces, the laxly reticulate venation and the bacterial nodules. Ridley himself described the tetramerous flower which excludes the species from *Tarenna*. As described and cited in the Fl. Mal. Pen. vol. II, *T. Napieri* includes also *Stylocoryne mollis*.

I doubt if *Pavetta pilosa* Craib (Kew Bull. 1932, p. 433) is really distinct but I have not seen the type. Similarly with *P. Wallichiana* which Craib has resurrected (Fl. Siam. Enum. 2, p. 171).

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Randia

R. densiflora Benth.

Fl. Hongk. 1861, p. 155.

This is another common and variable species which is in need of a critical study from living specimens. The flowers may be sessile or distinctly pedicelled, glabrous or very hairy: the calyx varies in size in different collections from 2–5 mm. long and the style projects from 6–10 mm.

Merrill has recently proposed the name *R. cochinchinensis* (Lour.) for the species on the grounds that it is *Aidia cochinchinensis* Lour. (Comm. Lour. Fl. Cochinch. 1935, p. 365). But I find that the evidence is far from satisfactory. There is a fragmentary specimen of Loureiro's *Aidia* at the British Museum which S. Moore identified as a *Randia*, possibly *R. eucodon* K. Schum. but, the specimen lacking flowers, it was impossible to be certain (Journ. Bot. 1925, p. 250). Merrill has rejected Moore's identification without publishing his reason. If one reads Loureiro's description, one finds that *Aidia* should have "Filamenta nulla Bacca . . . 1-sperma" and that *A. cochinchinensis* should be "Arbor magna" and should have "racemis laxis." How then can 'Aidia ex descriptione' be *Randia*? It may be remarked that Chevalier and Merrill first identified *A. cochinchinensis* with *Fagraea fragrans* (Loganiaceae). This difficulty was overcome by supposing that Loureiro mistakenly attributed the local name and wood-characters of the *Fagraea* to the specimens of *Randia* which he described. But, I would ask, might not Loureiro mistakenly have given the name *Aidia cochinchinensis* to the specimens of *Randia* which he dried? When such doubt prevails, the species should be dismissed as a *nomen dubium*. *Randia densiflora* has a dense cyme, obvious filaments, and a many-seeded berry: in no way can it be called a big tree. It is certainly not *Aidia cochinchinensis*.

R. spinosa (Thunb.) Poir

Lam. Encycl. Suppl. 2, 1812, p. 829.

Syn. *R. dumetorum* Poir, loc. cit.

R. oocarpa Ridley, Journ. Str. Br. R. As. Soc. 79, 1918, p. 79.

Ridley states that *R. oocarpa* of Malaya differs from *R. dumetorum* of India in having thinner, larger leaves, smaller flowers, more lax habit and small and scantier thorns, but I do not see how any of these points are to be confirmed. The spines of the Malayan plants vary from .1–10 cm. long, being longest on the main stem and smallest on the twigs from which they are often absent. In the character of the leaves I find no difference between the

description of the Indian and Indo-Chinese plants and that of Ridley's. The habit is too variable and little known to be used as a specific character. But it does seem that the petals of the plants from Malaya and Lower Siam are smaller than those from India and Indo-China, but this point needs confirmation from many more collections. Ridley did not give the size of the corolla. Hence I conclude that *R. oocarpa* can, at most, be a small flowered variety of *R. spinosa* with which it agrees in vegetative and floral construction, including such details as the veins of the leaf, the shape of the sepals, and the size and colour of the fruit.

The synonymy of the species is given in part by Merrill (Comm. Lour. Fl. Cochinch. p. 367).

Tarenna

- T. Napieri* Ridley = *Pavetta naucleiflora* Don
T. papillosa Ridley = *T. appressa* (King) Corner
T. rudis Ridley = *T. longifolia* (Don) Ridley
T. lancifolia Ridley = *T. appressa* (King) Corner
T. salicina Ridley = *Pavetta indica* L. (or *P. graciliflora*)

The distinction between *Stylocoryna* and *Tarenna* rests with the 2-multiovulate loculi of the first and the 1-2 ovulate loculi of the second. In both the flower is pentamerous and fragrant (? always): in *Pavetta* the corolla is white, but in *Tarenna* it is white, yellow or green. Ridley adds that the style is long in *Stylocoryna* and short in *Tarenna*, but I do not see that this character is at all acceptable without stating the ratio of length of style to length of corolla-tube. The species of *Stylocoryna* are nearer to those of *Tarenna* than to any other genus of Rubiaceae and, the ovular-criterion being imperfect, I prefer to unite the two genera. *T. appressa* (*Stylocoryna appressa* King) is exactly intermediate having 2-4 ovules in each loculus. That the grouping of Rubiaceous genera according to the number of ovules in the loculi is artificial, just as in the Euphorbiaceæ, is shown by these two genera.

The status of Ridley's species, which I have given as synonyms, are discussed under the species to which I have referred them.

T. appressa (King) Corner nov. comb.

Basinym:—

Stylocoryne appressa King, Mat. Fl. Mal. Pen. 4, 1903, p. 90.

Synonym:—

S. appressa var. *papillulosa* King, loc. cit.

Tarenna papillosa Ridley, Fl. Mal. Pen. II, 1923, p. 103 (= a misnomer for *S. appressa* var. *papillulosa* King).

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Tarennia lancifolia Ridley, Fl. Mal. Pen. V, 1925, p. 316.

This species is so variable in the hairiness of the underside of the leaf that I cannot distinguish King's variety with satisfaction. The texture of the leaf varies from membranous to subcoriaceous, the pairs of side-veins from 6-9 to 10-12, and the corolla-tube varies from .7-1.3 cm. long.

Ridley distinguishes *Stylocoryne* from *Tarennia* by the long style and 2-many seeded ovarian loculi of the former. Therefore *T. papillosa* must be *Stylocoryne* because it has the style projecting 7-8 mm. from the corolla and it has 2-4 ovules in each loculus. But, as I have said, the distinction between the two genera being unsatisfactory, I prefer to unite them.

Both syntypes of *T. lancifolia* are in the Singapore Herbarium, namely Burkill 8686 and Haniff 4954. They are identical with King's species. Ridley's statement that the fruit of *T. lancifolia* has "2, flattened, rounded" seeds probably refers to the clump of half-developed seeds in each loculus of the immature fruit.

T. appressa is well-characterised by its lanceolate leaves more or less pubescent beneath, small tooth-like sepals, and white, fragrant corolla with green tips to the petals. It is rather common in the Malayan forest.

T. longifolia (Don) Ridley

Fl. Mal. Pen. 2, 1923, p. 104.

Basynym:—

Ixora longifolia Don, Gen. Syst. 3, 1834, p. 573.

Synonyms:—

Webera grandifolia Hook. f., F.B.I. 3, 1880, p. 105.

Tarennia grandifolia (Hook.) Ridley, loc. cit.

Tarennia rudis Ridley, loc. cit. p. 103.

? *Tarennia sumatrana* (Böerl.) Ridley, Kew Bull. 1926, p. 69.

Webera sumatrana Böerl.

Tarennia hispidula Craib, Fl. Siam En. 2, 1932, p. 91.: var. *brevipes* Craib, var. *Smithiae* Craib, loc. cit.

Hooker distinguished *W. grandifolia* from *W. longifolia* by its rather broader leaves having glabrous undersides with only 12-15 pairs of nerves (*W. longifolia* having the leaves softly tomentose beneath and 16-30 pairs of nerves). To these differences King added that the sepals were short blunt teeth in *W. grandifolia* and deeply linear lobes as long as the receptacle in *W. longifolia* (Mat. Fl. Mal. Pen. 4, 1904, p. 139). Ridley added that *T. longifolia* had a pendulous corymb and *T. grandifolia* an erect one.

After studying the specimens in the Singapore Herbarium I conclude that these distinctions are not constant because they are displayed in various combinations and intermediates and that Ridley's distinction concerning the corymb is wrong because it is not merely pendulous but vertically deflexed from the base of the peduncle in both species. I find that *W. grandifolia* as understood by King generally has leaves glabrous on both sides, nerves 10–20 pairs, sepals 1–1.5 mm. long, corolla-tube 5–7 mm. long and petals 6–8 mm. long: that *W. longifolia* has the leaves glabrous above and softly tomentose beneath, nerves 16–27 pairs, sepals 1.5–2.5 mm. long, corolla-tube 8–10, 9–11, or 11–13 mm. long, and petals 4–6 mm. long.

But, several collections agreeing with *W. longifolia* have the leaves hairy on the upperside as well, and others have them only very slightly hairy on the underside. The collection, Ridley 14315, has the sepals and corolla of *W. longifolia* and the glabrous leaves of *W. grandifolia*. The collections, Wray 2081 and Scortechini 228, have the sepals of *W. longifolia*, the venation of *W. grandifolia* and the blade sparsely adpressedly hairy on the underside.

The collection, Kloss 14810 (Sumatra), referred by Ridley to *Tarenna sumatrana*, has the corolla-tube 10 mm. long, the petals 6–7 mm. long, the sepals 1–1.5 mm. long and the leaves sparsely and minutely hispid beneath. It combines, that is, the apparent floral differences between *T. grandifolia* and *T. longifolia*.

Tarenna hispidula Craib has the leaves and venation of *T. grandifolia* (but the leaves are sparsely puberulous beneath), the corolla of *T. longifolia* and the sepals intermediate. Craib's two varieties, based on a single collection each, would make a good precedent for describing a new variety from every collection.

As I can find no constant difference of specific value between *T. longifolia* and *T. grandifolia*, I reduce the latter to the former. If it seems that every gap between them has not been bridged, future collections will certainly supply the defect. That the species has not been understood is evident because the characteristic deflexed posture of the inflorescence has not been recognised. The large, cuspidate, many-veined leaves, the white fragrant flowers and the deflexed peduncle make the species as characteristic in *Tarenna* as *I. pendula* in *Ixora*.

A specimen of one of the syntypes of *T. rudis*, namely Foxworthy 2952 (misquoted 2592 by Ridley), is in the Singapore Herbarium. It is identical with *T. longifolia*. The identity was doubtless overlooked by Ridley because he placed *T. longifolia* in the wrong section of his key.

Timonius

T. compressicaulis (Miq.) Boerl.

Handl. II, 1, 1891, p. 133.

Basynym:—

Polyphragmon compressicaule Miq., Fl. Ind. Bat. 2, 1857, p. 235.

Synonym:—

T. Finlaysonianus Hook. f., F.B.I. 3, 1880, p. 127.

T. jambosella var. *Finlaysoniana* King, Mat. Fl. Mal. Pen. 4, 1904, p. 128.

That *T. Finlaysonianus* is a synonym of *T. compressicaulis* I am certain from the detailed description of *T. compressicaulis* given by Valeton (Bull. Dep. Agr. Ned. Ind. 26, 1909, p. 54) and from the fact that a specimen of the collection Achmad 23 (Simaløer Island, pr. Sumatra) in the Singapore Herbarium and so determined by J. J. Smith is identical with the Malayan species. As Valeton remarked, the compressed stem, glabrous obovate leaves, rather large silky stipules, the 4-5-merous male corolla, the 6-7-merous female corolla and the 14 loculi of the fruit render the species most distinctive. It is rather common on the rocky and sandy shores of Malayan islands and, doubtless, occurs on most others in the Rhio Archipelago as well as on those near Sumatra.

T. flavescens (Jack) Baker

Fl. Mauritius, 1877, p. 144.

Basynym:—

Helospora flavescens Jack, Tr. Linn. Soc. 14, 1823, p. 127, t. 4, f. 3.

Synonym:—

T. peduncularis Ridley, Fl. Mal. Pen. 2, 1923, p. 113.

As Valeton has shown, there is no doubt of the interpretation of Jack's species which is one of the commonest in W. Malaysia (Bull. Dep. Agr. Ned. Ind. 26, 1904, p. 34). Ridley's name, based on the *nomen nudum* *Guettarda peduncularis* of Wallich's Catalogue, is thus untenable.

Vangueria

V. spinosa var. **mollis** Hook. F.B.I. 3, p. 136.

I have found this variety of the well-known *V. spinosa* rather common in open ground and secondary jungle in the neighbourhood of Kota Bahru, Kelantan. Hence it must be admitted to the Malayan flora, but whether it is truly a native of the forest has to be discovered.

In general appearance this *Vangueria* bears an extraordinary resemblance to the thorny *Randia spinosa* so that one must examine sterile plants carefully to distinguish them.

Gardens Bulletin, S.S.

According to Robyns, the Kelantan plants should be *Meyna pubescens* (Bull. Jard. Bot. Brux. II, 1928, p. 235). But I am unable to follow this author in his treatment of the genera and species. Hooker, King, Pitard, Koorders and Valetton have regarded *V. spinosa* as a variable species. Robyns has made the varieties into species and distinguished them under the genus *Meyna*, but in his key to the species I do not find that any character of decided morphological value has been employed.

The species of *Meyna* are placed in two groups whether hairy or glabrous, though pubescence is one of the most variable and unspecific characters of tropical dicotyledons, above all these Rubiaceæ. I have no doubt that field-botanists will find such splitting of *V. spinosa* quite impracticable.

Meyna is said to differ from *Vangueria* in the presence of thorns, the dwarf flowering shoots and the generally sessile clusters of flowers, the inflorescences of *Vangueria* being pedunculate cymes. If genera are to be separated on such grounds, then away go *Randia*, *Canthium*, *Psychotria*, *Lasianthus*, *Timonius*, *Urophyllum*, *Hedyotis* and *Argostemma*, to mention but a few. The old, easily recognisable genera are bereft of their usefulness and in their place stand congeries of artificial entities.